ECHNOLOGY DEPARTMENT

ROADS AND STREETS

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JANUARY 1948

Allis-Chalmers HD-19 Tractor equipped with 50 Timken Bearings working on a new highway in Kentucky.

Allis-Chalmers HD-19 Digs in For Better Roads!

Described as the world's largest and most powerful crawler tractor, the new Allis-Chalmers HD-19 already is making its presence felt in the construction industry.

Weighing 40,000 lbs. this new tractor is powered with a Diesel engine developing 163 H.P. at the flywheel and equipped with hydraulic torque converter drive for smoother, faster operation — less gear shifting.

Into its development, Allis-Chalmers have put all their years of tractor experience; all their tractor know-how and productive skill. Thus Timken Tapered Roller Bearings again are contributory factors of high performance and low maintenance, a total of 50 being used at the following positions: bevel gear shaft, 2; final drive, 12; front idler, 4; support roller, 8; truck wheels, 24.

No matter what kind of equipment you make or buy it will pay you to have Timken Bearings in it and to look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

...ST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←

R v. 90' Jan.-June 1948

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

DOING JOBS LIKE THESE . . . *throughout the Construction Field!*

Rock Drilling	Trench Digging	Spray Painting	Tie Tamping
Concrete Breaking	Driving Sheet Pile	Sand Blasting	Timber Sawing
Demolition	Backfill Tamping	Spraying Cement	Riveting

At almost every turn you need compressed air!

The above check list indicates some of the many compressed air jobs to be done, all of which are accomplished easily, quickly and economically with Schramm Air Compressors.

Here's *why* you profit, as others have, by using Schramm: they're compact, lightweight, easy to start; built for rugged jobs, to provide a continuous flow of air.

Important features include 100% water cooled; mechanical intake valve; forced feed lubrication and easy, electric push-button starting.

Performance everywhere has proved Schramm Air Compressors can do any compressed air job you require. Write today for list of models and sizes.

TOOLS for the JOB

Schramm Inc. also has a complete line of Pneumatic Tools to offer and recommend for operation by their Compressors.

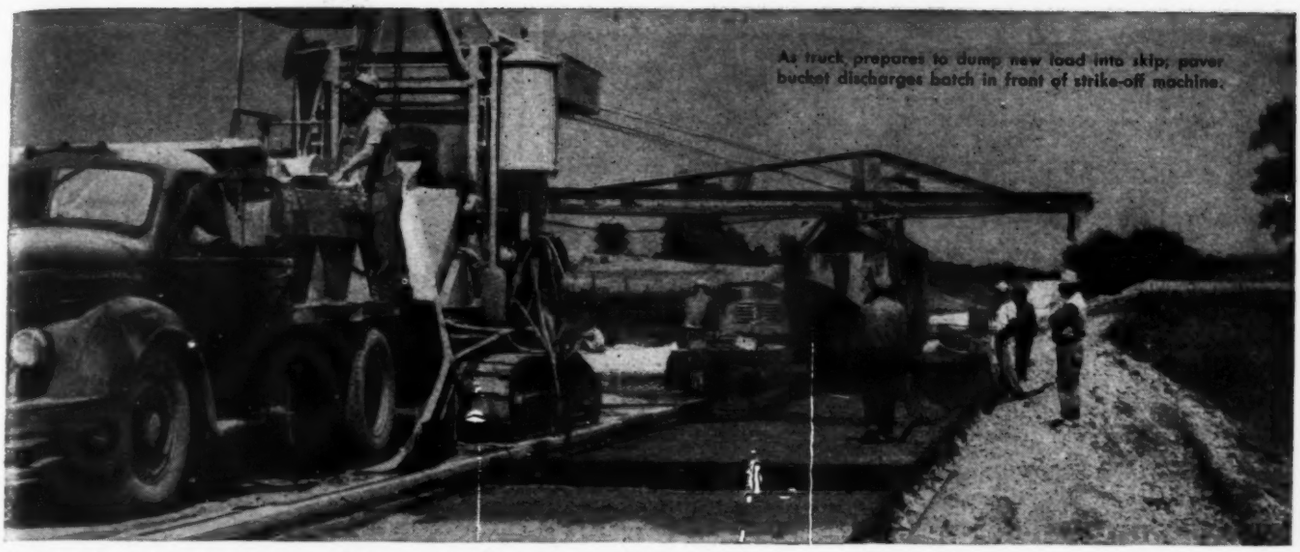
These include Rock Drills, Paving Breakers, Trench Diggers, Clay Spades, Backfill Tampers, Tie Tampers, Sheeting Drivers, Demolition Tools, Chain and Circular Saws.

Write for bulletins and prices.

SCHRAMM INC.

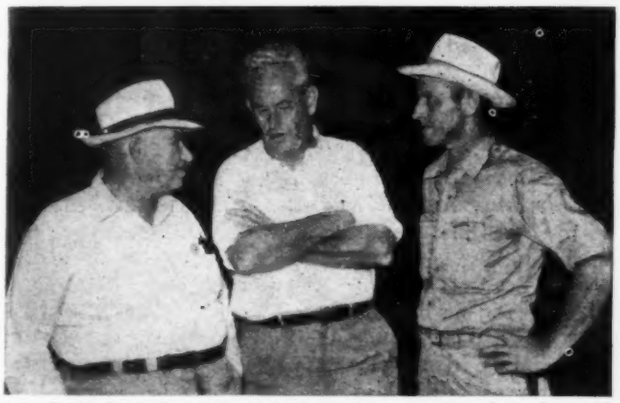
THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

Tech.

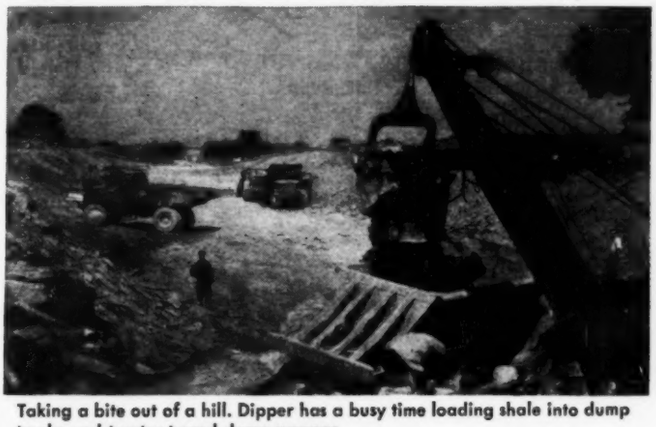


As truck prepares to dump new load into skip, paver bucket discharges batch in front of strike-off machine.

Philadelphia-Harrisburg Highway Undergoes Repair



John S. "Jack" Anderson (center), Hempt Bros. superintendent, chats with R. A. "Ike" Moore (left), resident engineer, Penna. Dept. of Highways, and Merle Elicker, Hempt Bros. foreman.



Taking a bite out of a hill. Dipper has a busy time loading shale into dump trucks and tractor-towed dump wagons.

Resurfacing, widening and relocation are three major repair jobs now taking place at various points along U. S. 422, through route from Philadelphia to Harrisburg. These recent construction scenes show one of the relocation jobs—a 4.6-mile double-barreled stretch of road between Lebanon and Myerstown. Contractor, Hempt Bros., Camp Hill, Pa. Bar mats, road joints, reinforcing bars and guard rail were furnished by Bethlehem.

Installing dowel caps on bar-dowel unit. Joint is designed to minimize load-transfer problems caused by heavy wheel loads.

With finishing machine standing by, Bethlehem Hinged Bar Mat is lifted into place. Two men handle mat with ease.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

LEADING BETHLEHEM HIGHWAY PRODUCTS
Road Joints • Reinforcing Bars • Bar Mats • Guard Rail
Tie-Rods • Guard Rail Posts and Brackets • Spikes
Wire Rope and Strand • Hollow Drill Steel
Fabricated Structural Steel • Bolts and Nuts
Sheet and H-Piling • Timber Bridge Hardware

BETHLEHEM STEEL

ROADS AND STREETS

JANUARY, 1948 • VOL. 91 • No. 1

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Coming Articles

How Are We Doing?
Look for 1947 review and 1948 forecast in February R&S. Several states individually expect to spend over $100,000,000

Contractor Prequalification
Another article on this subject, this time highlighting one state's successful experience

Bituminous Road Mix
Methods using travel plant on a western road job

Water-Bound Macadam
A new vitamin pill for this languishing type of road base? Perhaps. We'll describe Ohio experimental contract jobs in which a vibratory roller was efficiently used to choke coarse rock layers with fines

Airport Snow Removal
Summary of CAA's recommended practice

Bridges
Several project articles due, describing design and construction features of some of the interesting structures recently built or being built

Expressways
Complicated field problems and job methods, as seen on additional projects in California, New York, Pittsburgh and other cities

Soil Stabilization and Compaction
Series of articles will review fundamentals. Beginning soon

In This Issue

Twin Falls Airport—Design and Construction 53
Editorials 60
67-Mile Hot-Mix Contract 62
Erecting Cantilever Bridge 66
Why Pre-Qualification 68
By E. T. Nettleton, Engineer of Contracts, State Highway Dept. of Connecticut
Contractors at Work—Travel Plant Job, U.S. 30, Idaho 70
Highway Research Board Meeting Summary 72
Traffic Actuated Signal System 78
By James L. Hays, N. J. Highway Department
Safety Hints for Construction Crane Operators 80
200-Ton Super Compactor Tried at Baltimore Airport 82
By Harold J. McKeever, Editor, Roads and Streets
Probable Continuance of Wage and Price Increases 91
By Halbert P. Gillette
Job and Equipment Ideas 94
Lime Used in Airfield Base 96
Hand Apparatus for Undisturbed Soil Samples 98
Precast Deck Slabs for Small Bridges 99
Long Range Planning Studies 101
By G. Donald Kennedy, Vice Pres., Automotive Safety Foundation
How to Select and Use Dragline Buckets 104
By Page Engineering Co
Contractor Men Hold Safety Meeting 106
Fineness Modulus Worthy of Wider Use 107
By Stanton Walker, Director of Engineering, National Sand and Gravel Association
Contractor-Highway Committee 108
California's Latest Results in Asphalt Subsealing 110
By H. L. Cooper and W. R. Severing, California Division of Highways
How to Appraise Housing for Condemnation 112
Preparation of Bases for Black Top 113
By E. D. Devereaux, County Engineer, Shiawassee County, Mich.
Street Bridges Raised to Clear Bigger Locomotives 115
Construction Equipment Maintenance:
More and Better Trucks Due 116
New Equipment and Materials 117
Manufacturers Literature 123
With the Manufacturers 124
Clearing House 130

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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A WORK HORSE ON WHEELS

Lorain TL-20 offers a "work and travel" combination that gets more jobs done faster

YOU GET MORE FEATURES, MORE VALUE IN THE TL-20

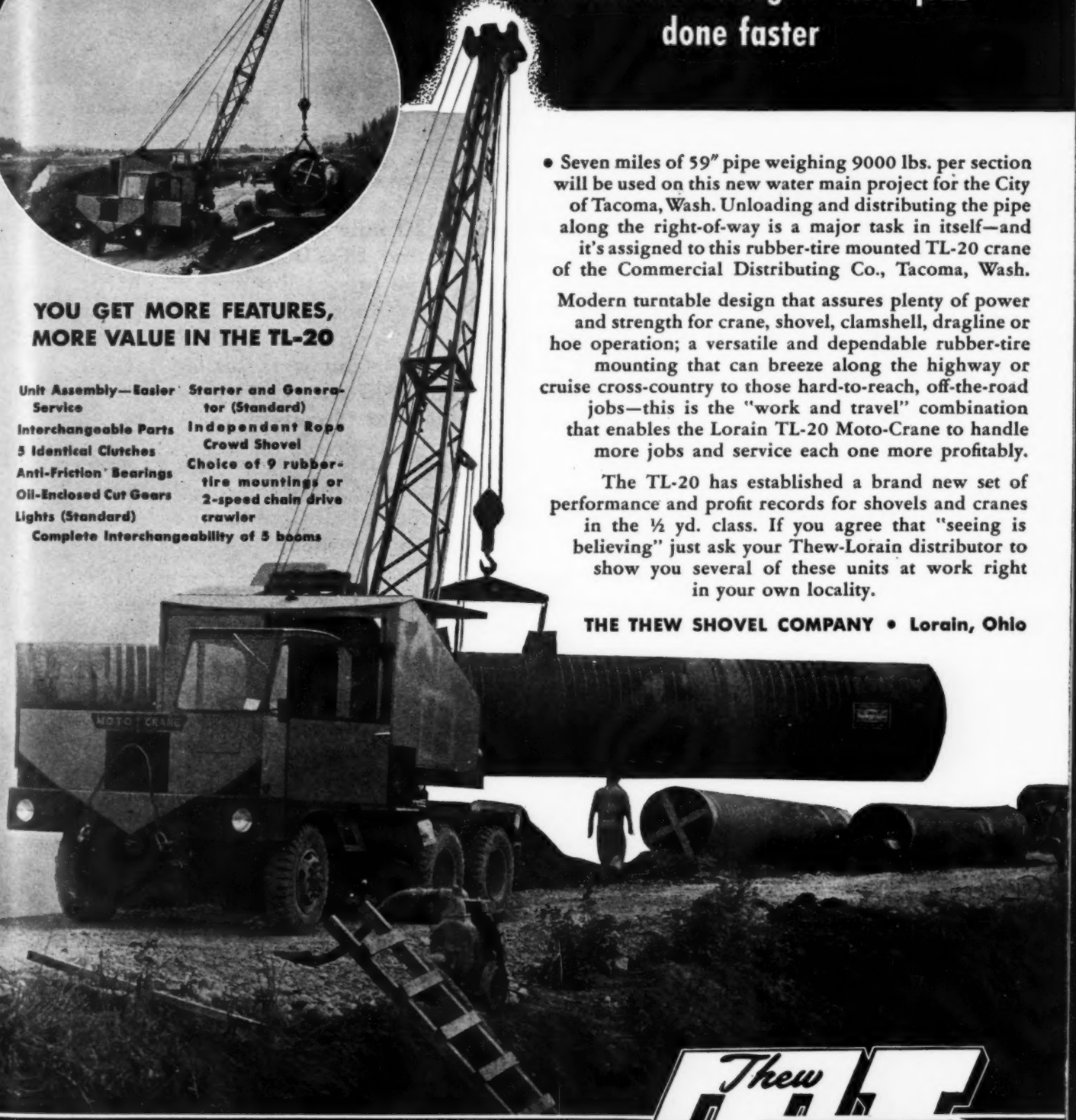
- Unit Assembly—Easier Service
- Interchangeable Parts
- 5 Identical Clutches
- Anti-Friction Bearings
- Oil-Enclosed Cut Gears
- Lights (Standard)
- Starter and Generator (Standard)
- Independent Rope Crowd Shovel
- Choice of 9 rubber-tire mountings or 2-speed chain drive crawler
- Complete Interchangeability of 5 booms

• Seven miles of 59" pipe weighing 9000 lbs. per section will be used on this new water main project for the City of Tacoma, Wash. Unloading and distributing the pipe along the right-of-way is a major task in itself—and it's assigned to this rubber-tire mounted TL-20 crane of the Commercial Distributing Co., Tacoma, Wash.

Modern turntable design that assures plenty of power and strength for crane, shovel, clamshell, dragline or hoe operation; a versatile and dependable rubber-tire mounting that can breeze along the highway or cruise cross-country to those hard-to-reach, off-the-road jobs—this is the "work and travel" combination that enables the Lorain TL-20 Moto-Crane to handle more jobs and service each one more profitably.

The TL-20 has established a brand new set of performance and profit records for shovels and cranes in the ½ yd. class. If you agree that "seeing is believing" just ask your Thew-Lorain distributor to show you several of these units at work right in your own locality.

THE THEW SHOVEL COMPANY • Lorain, Ohio



Lorain

Thew Lorain TL 20

EUCLIDS Speed Tough Highway Job

IN WEST VIRGINIA FOR VECELLIO and GROGAN

Rugged construction of Rear-Dump Euclids withstands the impact of loading heavy excavation by large shovels.

● Rebuilding the 10 mile Pineville-Welch highway required moving 900,000 cubic yards of earth and rock. From one of the deepest cuts in West Virginia road construction, 185 feet in depth, more than a quarter of a million cubic yards of heavy excavation were hauled for fill. Rear-Dump Euclids of 15-ton capacity were loaded by 1½ to 2½ cubic yard shovels.

Vecellio and Grogan used five Euclids to move most of the excavation on this contract. Because of their simple but rugged design the Rear-Dump Euclids delivered big yardages efficiently day-after-day. This dependable performance, combined with ample power and speed, cut hauling costs and kept the job on schedule.

Your Euclid representative or distributor will be glad to show you how Euclids are built for low cost hauling on a wide range of jobs.

Because of the high dumping angle and distance of the chute from the rear wheels, the load is dumped over the bank.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS *Move the Earth*

TOUGH GOING all the way!

...but NORTHWESTS are built to eat it up!

Look at this picture—*rock* all the way, both for the draglines and the shovel. Northwests are built to do the toughest jobs that Shovels, Cranes, Draglines or Pullshovels have to do. The rotating base and crawler base are heavy steel castings. Cast machinery side frames maintain shaft alignment and reduce wear. Ball and roller bearings assure the maximum delivery of power. Uniform Pressure Swing Clutches are cool running—long lifed—smooth operating. The Cushion Clutch protects operating machinery from the effects of shock overload when the dipper or bucket "hangs up" on an immovable rock. This combination of advantages along with other Northwest features make the Northwest a real Rock Machine.

When you have a machine that is built for the tough jobs you don't have to worry about the profit side of the ledger. Northwests are money makers. That is proved by the fact that one out of every three Northwests sold is a repeat order in the hands of successful contractors. Plan now to follow the Northwest Crowd.

NORTHWEST ENGINEERING COMPANY
1504 Field Building, 135 South LaSalle Street
Chicago 3, Illinois

Follow the NORTHWEST CROWD

Still the Standard toward which others build!

If you have a REAL ROCK SHOVEL *you won't have to worry about output in dirt*

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Speed up your dozer work wi

4 Speeds forward
4 Speeds REVERSE
... up to 15 m.p.h.

Today's 180 h.p. Model C Tournadozer brings you the speed and economies of rubber-tired power you've always wanted on your dozer work.

For example . . . consider how much more production you'll get with Tournadozer speeds up to 15 m.p.h. . . . both forward AND REVERSE! That's approximately double the fastest crawler speed.

Increased efficiency

In addition, the Tournadozer's new constant-mesh transmission gives you instant selection of gear ratios anytime . . . without loss of momentum, or stopping to shift gears. Just move selector lever to speed you want and air-actuated clutches give it to you RIGHT NOW.

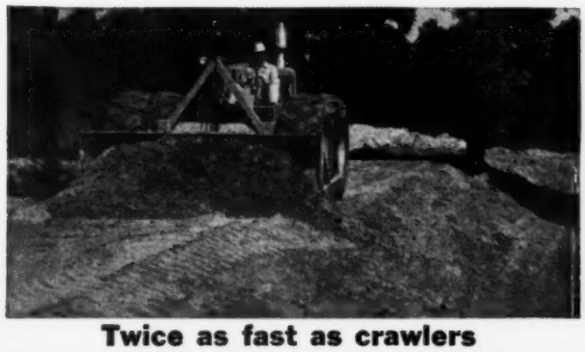
You'll also find its low center of gravity and wide tread give you greater stability . . . its short-coupled wheelbase increases maneuverability. And remember, you get the same fast, easy blade action you have come to expect from LeTourneau cable dozers.

LETOURNEAU LET EQUIPMENT

See your Le Tourneau Distributor NOW for complete information

LET

rk with a TOURNADOZER



Twice as fast as crawlers

Tournadozer gives you four speeds up to 15 m.p.h. . . . both forward and reverse . . . plus instantaneous non-stop speed selection, which enables you to get into higher gears faster . . . climb steep grades and soft fills easier . . . lower dead-head reverse time.

Works or travels anywhere

Tournadozer can go anywhere on job in a hurry . . . make fast job-to-job moves over pavement at 15 m.p.h. No waiting for trailer. When your dozer is in one spot and you need it in another . . . just hop on and go.

Operator's dream come true

Operator rides easy on big low-pressure tires . . . sits easy on hydraulic suspension seat . . . takes it easy because handy air-actuated controls take the labor out of operating. No neck-stretching . . . no clutches to fight . . . no end-of-day slow down.

Ample flotation and traction

Four big 21.00 x 25 low-pressure tires assure ample flotation and traction for the toughest kind of going . . . there are no track rollers to lubricate. . . . no expensive moving parts to grind and wear in abrasive materials. You roll on air instead of steel.

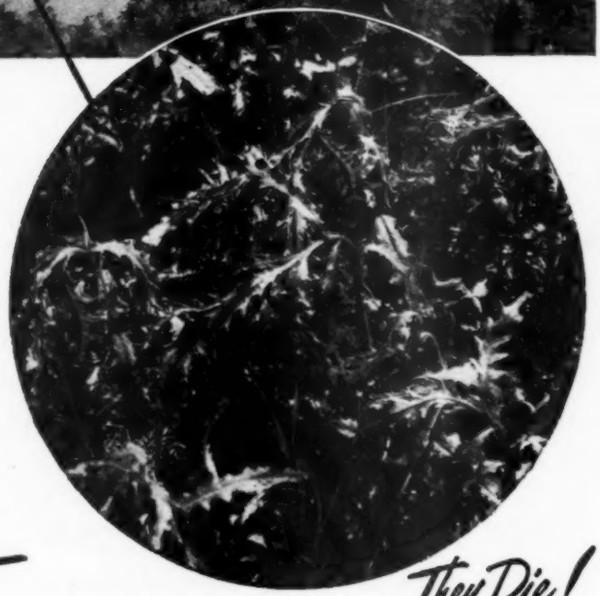
• See what it can do for you

Why buy slow-moving, high-maintenance dozer equipment . . . when you can get a modern, high-speed Tournadozer? Check with us today for complete information on Tournadozer performance, prices and delivery . . . ORDER NOW!

LETOURNEAU PEORIA, ILLINOIS HIGH-SPEED RUBBER-TIRED TOURNADOZERS

Here's how Esteron 44 kills

Tough, stubborn weeds . . . and woody growth!



Dow Weed Killers mean business! When stubborn, troublesome weeds threaten to take over the right of way, modern maintenance crews give 'em a good dose of Esteron 44—the powerful 2,4-D Weed Killer created by The Dow Chemical Company to destroy *woody stubble* and *cut-over brush.*

Esteron 44 has proved effective against such plants as alder, aspen, willow—box elder, sassafras, elderberry—honeysuckle, locust, poison ivy, wild cherry, grape and sumac—and a long list of others, which are expensive to cut, mow or burn.

Do not take half-way measures! Get the facts from the "firing line"—where the weeds are dying! See the case histories for yourself. Ask your usual source of supply—or write direct to Dow for free literature on Esteron 44; also 2-4 Dow Weed Killer and Dow Contact Weed Killer.

They Die!

Esteron 44 destroys or inhibits herbaceous and woody growth, spares grass and allows the establishment of good sod.

Cut maintenance costs with—

DOW WEED KILLERS

AGRICULTURAL CHEMICAL DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis
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DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

One-man gravel getter...

WITH TWO-FISTED PUNCH

ADAPTABLE to the operating of many kinds of auxiliary equipment, "Caterpillar" Diesel Tractors keep finding more and more jobs to do—*better, quicker, cheaper.*

With two such valiant helping hands ("Caterpillar" matched Bulldozer and mounted Hystaway dragline crane), the D7 in these California scenes makes gravel digging and truck loading so easy that little experience is required to man the controls. In fact, the operator on this job had never handled any type of shovel or dragline before the day these photographs were taken. The rig is also used for removing overburden.

Users everywhere say: where there's time to be saved, more work to be done, greater profits to be made, "Caterpillar" is the power and equipment that's most certain to "deliver the goods."

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

• The standard model D7 Tractor is priced (without Bulldozer and Hystaway) at $7960, F.O.B. Peoria, subject to change without notice.

CATERPILLAR
REG. U. S. PAT. OFF.
DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

GET THROUGH—and keep going --no matter how tough the blizzard!

Spearhead your attack with WALTER SNOW FIGHTERS

HIGHWAY departments equipped with Walter Snow Fighters, usually make these powerful units their key equipment. Wherever vital highways must be opened fast, and kept open—where the toughest stretches exist—where drift-choked roads stop all other equipment, there you will find Walter Snow Fighters spearheading the attack.

The reason is obvious. Walter Snow Fighters are specially designed, engineered and equipped for the gruelling job of snow removal. They have the exclusive 4-point Positive Drive which provides 100% traction on snow and ice. They have tremendous power and rugged construction to mount bigger, more efficient plow equipment. They clear at higher speeds, remove greater volume per run, reduce clearance cost per mile.

● **YOUR WALTER DISTRIBUTOR** can give you detailed facts on Walter Snow Fighters. Meanwhile, write us for informative literature.

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

WALTER SNOW FIGHTERS

250 hp. Walter Snow Fighter. Mounts V-plow and right and left wings. Clears 28 ft. width, at speeds up to 30 mph.

REMEMBER WHEN?

..get MAXIMUM PERFORMANCE with MINIMUM CREWS

NOW- *complete Blaw-Knox* MECHANIZATION

Assures Better Paving . . . Fewer Men . . . Lower Costs . . . Earlier Completion

See your nearest Blaw-Knox Dealer before and after you bid.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
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The contractor's only single source for a complete outfit of job-tested concrete paving machinery is . . . . . **BLAW-KNOX**

Motor Graders take the toughest going—meet the toughest steering conditions . . . wade through heavy earth . . . spread road materials . . . dig and clean out ditches . . . uproot old pavement. Travel is frequently very slow. Every condition is present to make steering difficult.

Caterpillar uses Gemmer Steering equipped with the Gemmer "Anti-Kick" in their Motor Graders. Gemmer high efficiency . . . smooth easy transfer of power make steering easy. The "Anti-Kick", non reversing feature keeps road reaction from reaching the operator through the steering wheel.

Gemmer Steering is easier, more efficient in any vehicle, from slow moving off the road types to high speed highway classifications. Gemmer Steering is dependable—lasts the life of the vehicle with reasonable care.

3020

CATERPILLAR TRACTOR CO.
PEORIA, ILL.

TO
GEMMER MANUFACTURING COMPANY
IN APPRECIATION OF SERVICE
TO "CATERPILLAR" SINCE
1938

GEMMER
MANUFACTURING COMPANY
6400 MT. ELLIOTT ★ DETROIT 11, MICHIGAN

At last! an all-material, heavy-duty car unloading team!

Cuts unloading—stockpiling time as much as 90%

EXCLUSIVE NEW ADVANTAGES!

For All Materials . . . Crushed stone, granite chips, sand, gravel, agricultural lime, coal, road stone, coke, foundry sand, cinders, clay, chemicals, fertilizers, ores, wet concrete, etc.

For All Users . . . Road contractors, building supply yards, concrete products plants, foundries, quarries, railroads, ceramic plants, industrial power plants, chemical plants, etc.

Imagine a portable car unloader and stockpiler that can clear a car of stone or rock in 45 minutes! Imagine an unloading "team" that requires only one man's time . . . that frees expensive clamshells and other equipment for more productive work . . a team rugged enough to deliver up to three tons per minute through years of service, yet economical enough to pay off on intermittent work!

That's what Barber-Greene offers you in the new 358 and 363. Now for the first time you can truly eliminate hopper-car unloading problems, no matter what bulk materials you're handling!

Send for Full Details!

Use the coupon, or write for complete data, photos and specs on the 358 and 363.

Barber-Greene Company
Aurora, Ill.

☐ Send details on the 358 and 363

☐ Have a B-G representative call

Name .....

Street .....

City..... State.....

Barber-Greene
BARBER-GREENE COMPANY
AURORA, ILLINOIS

WRAP UP YOUR MAINTENANCE PROBLEMS WITH THIS EQUIPMENT PACKAGE . . .

Allis-Chalmers HD-5 Tractor with Tracto-Shovel* and Model A-D Motor Grader

*All-'Round, All-Year Machine — Besides 1 cu. yd. standard bucket, interchangeable attachments for Tracto-Shovel include ¾ cu. yd. narrow bucket and bucket teeth, 2 cu. yd. snow loader bucket, bulldozer blade and V-type snowplow. Outfit may be used with Gar Wood 2-wheel scraper, too, using shovel hydraulic system.

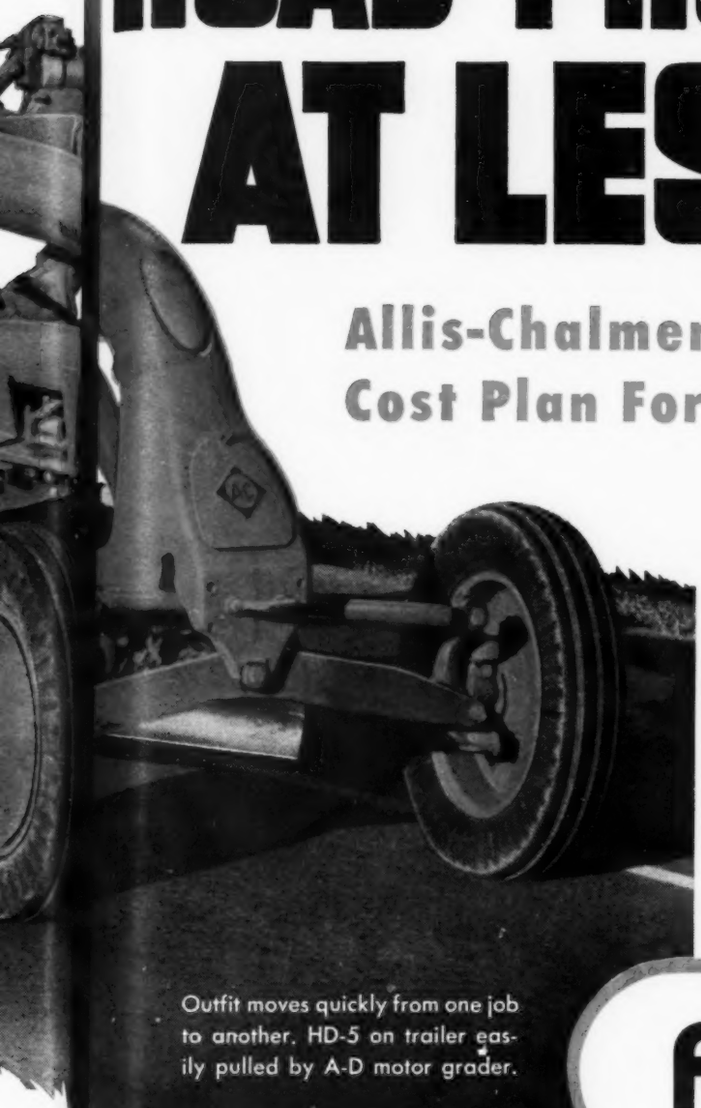
SOME OF THE JOBS YOU CAN DO WITH THIS COMBINATION—*working together or separately:*

- Clean and shape-up ditches
- Cut and smooth backslopes
- Handle regular maintenance
- Widen and reshape roads
- Make driveways
- Build berms
- Scarify roads
- Backfill pipe, culverts, bridges
- Take out cuts
- Make fills
- Do all bulldozing
- Plow, move and load snow
- Skid trees
- Load rocks and stumps
- Dig and load dirt or other material
- Mix black-top
- Do crane work
- Handle hauling or pulling

A TYPICAL JOB TO BE DONE— straightening out road, cutti down hill and making ditches f proper drainage.

ROAD PROTECTION AT LESS COST

Allis-Chalmers Brings You A New, Low Cost Plan For Road And Street Upkeep



Outfit moves quickly from one job to another. HD-5 on trailer easily pulled by A-D motor grader.

No need to make a major investment in equipment to handle various jobs. Any maintenance work . . . and much of your construction . . . is quickly, efficiently done with this versatile combination — AT BIG SAVINGS. There is only a nominal original cost with correspondingly low upkeep . . . but the work accomplished is considerably widened. Take a look at the list of jobs you can do — it's endless! Whatever your maintenance problem, this equipment package will wrap it up at the lowest cost.

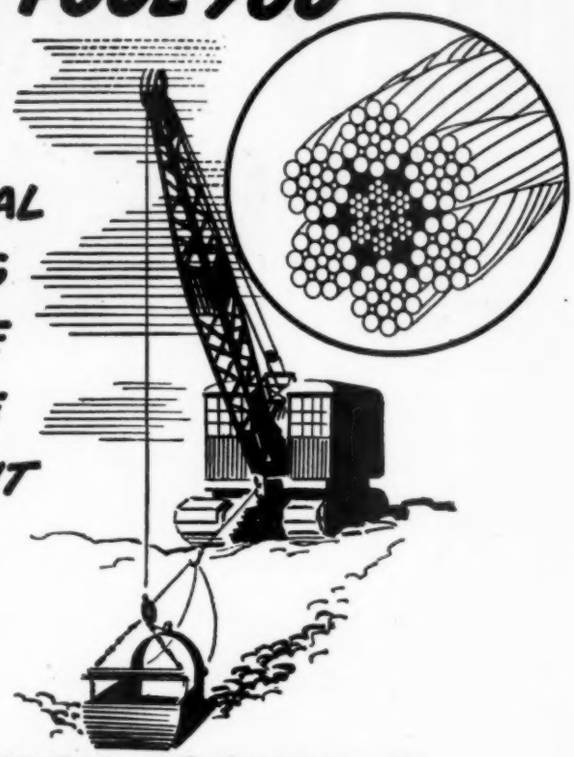
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

OB NEARING COMPLETION — all grading handled with HD-5 and Tracto-hovel and the Model A-D Motor rader. Surplus dirt loaded into trucks ith shovel . . . shaping and finishing one with grader.

CLEANING-UP DITCHES—here the road surface is kept intact, only ditches and slopes made. Accomplished by pulling up dirt with A-D motor grader and loading surplus into trucks with HD-5 and shovel.

CUTTING THE BACKSLOPES — sloping, ditching, rough and fine grading . . . all these jobs are quickly, accurately handled with the greater earth-moving capacity of the Model A-D motor grader. Its extra traction and power make it the ideal machine, too, for scarifying and plowing snow.

SOME ROPES FOOL YOU



U-W 6×16 FILLER WIRE IS IDEAL FOR DRAG CABLES ON DRAG LINE EXCAVATORS BECAUSE IT IS SUFFICIENTLY FLEXIBLE AND ABRASION RESISTANT

BUT...

FOR FACTORY CRANES A MORE FLEXIBLE ROPE IS BETTER WE RECOMMEND U-W 6×37 CONSTRUCTION FOR THIS PURPOSE

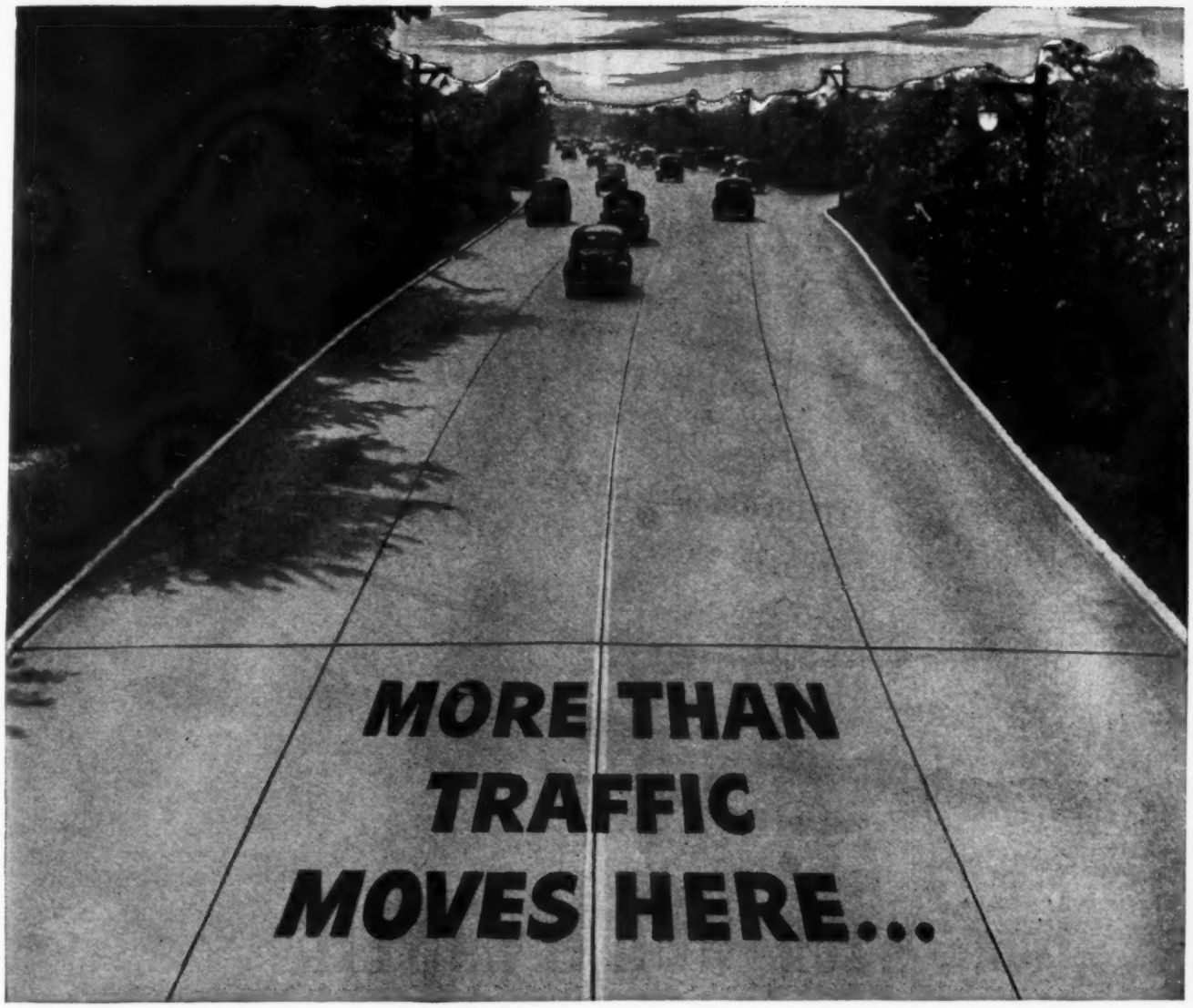
For longest and best service, always specify
U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

We invite you to let UPSON-WALTON engineer your tough rope jobs.

Copyright 1947—The Upson-Walton Company

THE UPSON-WALTON COMPANY
Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth
Main Offices and Factory: Cleveland 13, Ohio

114 Broad Street, New York 4
737 W. Van Buren Street, Chicago 7
241 Oliver Building, Pittsburgh 22



THE fractions of inches concrete pavements move during expansion and contraction play havoc when joints are improperly sealed.

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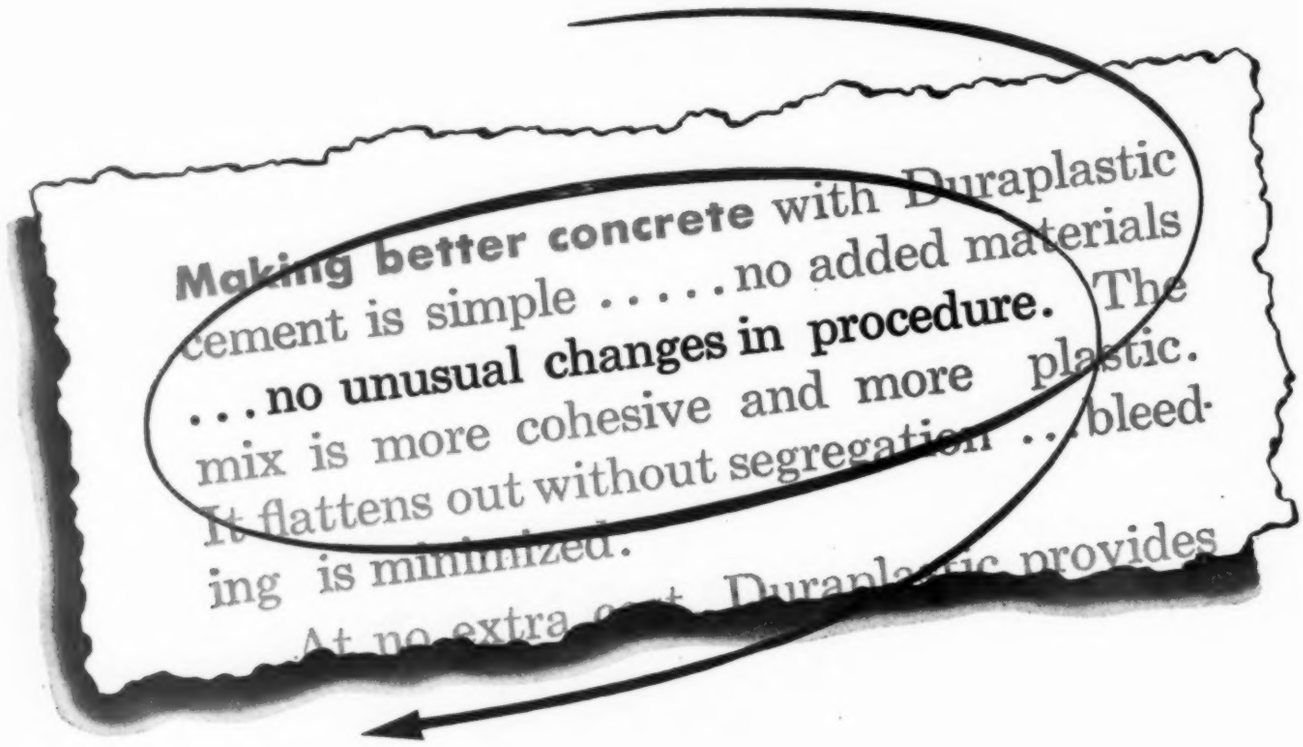
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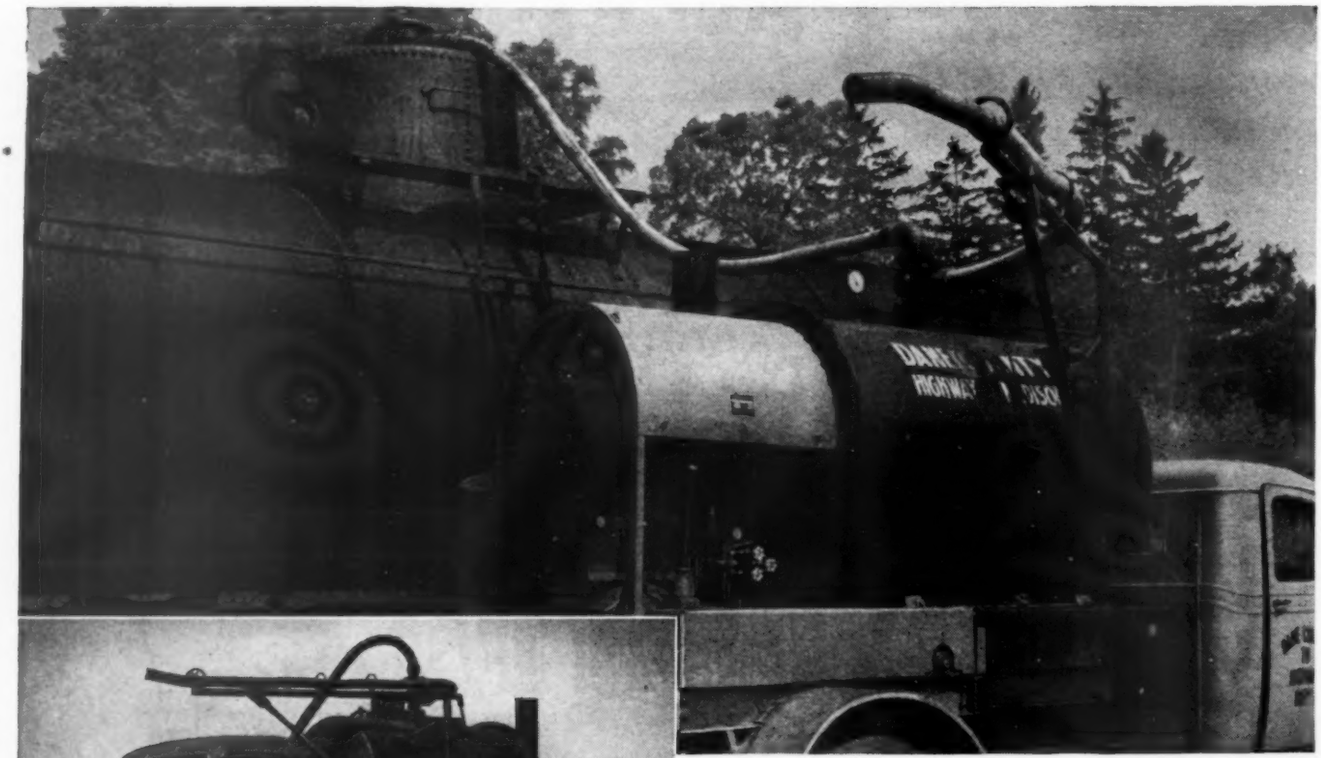

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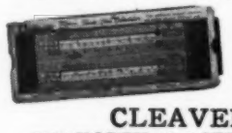

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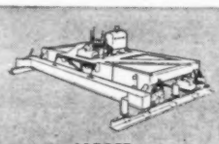

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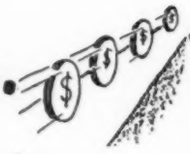
Plan now to make Asphalt resurfacing a major part of your 1948 road program. Here's why: it's the fastest and easiest way to rebuild worn and broken surfaces. For city streets, 4-lane highways, or farm-to-market roads, there are economical types of Asphalt construction that will give you the most miles of smooth-riding, easily maintained roads for your highway dollars.  To get unvarying top quality and a reliable supply use...

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ROAD AND STREET CONSTRUCTION METHODS AND COSTS

A NEW BOOK OF DATA

By

HALBERT P. GILLETTE and JOHN C. BLACK

This book was planned expressly for use by contractors, engineers and highway officials.

It is not a textbook, but a compendium of data, carefully selected with reference to their usability by highway builders and other persons concerned with highway construction costs.

In general the data are of two main classes—dollar and cents costs per mile, per square yard, per cubic yard, and the like, for use in quick approximate estimates; and details of material, labor and equipment costs, with records of man-hours and machine-hours, for use in close estimating and in studies to reduce costs or improve methods.

The data are from a great number of different sources, and are in widely varying detail.

All major articles carry descriptions to show clearly the class of work and the methods for which costs are given, and to provide a basis for further reference and study if desired.

Location and date of job and the source of information are given in the title and introduction to each article.

The grouping of subjects in chapters is convenient, but an unusually complete index is furnished as the main guide to any subject or sub-subject sought.

The authors are both men of practical experience in highway and other construction. Both are members of the American Society of Civil Engineers.

OUTLINE OF CONTENTS

CHAPTER 1. INTRODUCTION—Brief discussions of construction costs, prices, profits and the uses of cost data.

CHAPTER 2. COST INDEXES—Indexes of the U. S. Public Roads Administration and Interstate Commerce Commission, with brief explanations of their construction, uses and limitations

CHAPTER 3. OVERHEAD COSTS—Separate discussions of the overheads incurred by contractors and by states, counties and cities.

CHAPTER 4. ENGINEERING—Data from states, cities and other sources on the costs of various kinds of surveys and other engineering. There are brief articles on aerial surveys and seismographic soil and rock surveys.

CHAPTER 5. RIGHT-OF-WAY—A general discussion followed by records of actual experience and costs.

CHAPTER 6. EQUIPMENT—This chapter contains several rental and ownership expense schedules in full detail, followed by articles on operating and maintenance costs, including records of fuels, lubricants, etc., a mathematical analysis of the problems of selecting and retiring machines, and a table of depreciation rates.

CHAPTER 7. LABOR—Schedules of established minimum wage scales and records of wage rates in various states; comparisons of contract work and day labor; convict labor costs and other pertinent matter.

CHAPTER 8. CLEARING AND GRUBBING—Records of clearing with tractor-mounted equipment, hand and horse methods, stump blasting, etc.

CHAPTER 9. GRADING—Eighty-four pages of articles on grading with power shovels, scrapers of various types and sizes, elevators, blade graders, bulldozers, etc.; hydraulic grading; rock drilling and blasting; winter grading; special swamp grading; minor operations and hand work.

CHAPTER 10. HAULING AND HANDLING MATERIALS—Studies of hauling operations on power shovel jobs, concrete construction and bituminous construction; truck movements at yards; industrial railways; team and wagon hauling; and other articles

CHAPTER 11. PRODUCTION OF AGGREGATES—Articles on labor requirements and costs of producing sand, gravel and crushed stone at various locations.

CHAPTER 12. UNTREATED BASES AND SURFACES—Waterbound macadam, crushed rock and gravel construction.

CHAPTER 13. STABILIZATION OF BASES AND SURFACES—This chapter is devoted chiefly to work with calcium chloride, articles on portland cement and bituminous stabilization being given in the chapters on concrete and bituminous construction.

CHAPTER 14. BITUMINOUS SURFACES AND BASES—The five parts of this long chapter contain articles on various methods in different states: Part 1. Surface Treatments; Part 2. Bituminous Macadam; Part 3. Mixed-in-Place Construction; Part 4. Traveling Plant Construction; Part 5. Stationary Plant Construction.

CHAPTER 15. CONCRETE SURFACES AND BASES—Contains numerous detailed records of construction. There are articles on work with 27-E pavers, 34-E pavers, tandem set-ups, batching, hauling, curing, joints, cement-bound macadam, soil-cement roads, stabilization, and other subjects.

CHAPTER 16. BRICK PAVEMENTS—Records of brick pavement construction from various cities and states, including an article on vibrated monolithic. Short reference to granite block

CHAPTER 17. SIDEWALKS, CURBS AND GUTTERS—Miscellaneous prices and details of construction.

CHAPTER 18. WALLS, FENCES AND GUARD RAILS—A brief chapter of data on these items of highway construction.

CHAPTER 19. BRIDGES AND CULVERTS—Cost data on a large number of steel, concrete and timber bridges and grade separations—also culverts of various types. There are two articles on pump installations for underpass drainage.

CHAPTER 20. TUNNEL CONSTRUCTION—Detailed descriptions and data on the construction of 27 highway tunnels in the West.

CHAPTER 21. GRASS, SHRUBS AND TREES—Several articles on plantings for landscape improvement and protection.

CHAPTER 22. MISCELLANEOUS—Data on pedestrian underpasses, street car loading platforms, truck weighing stations, catch basins and manholes, lignin binder, water pumping, signs and markers, traffic striping, parking metars, highway lighting, radio communication with snow plows, accident prevention, and weather and construction.

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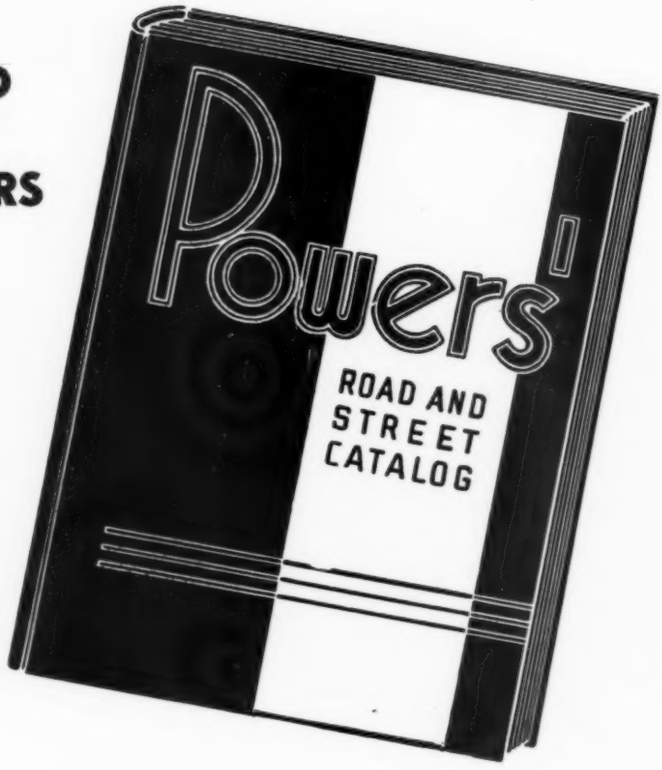

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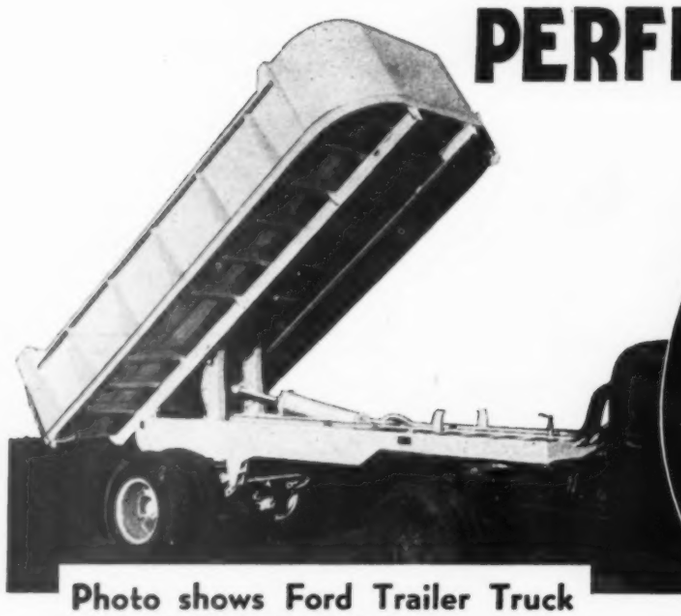

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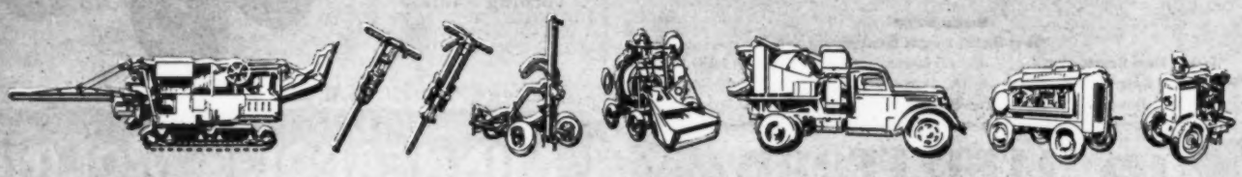

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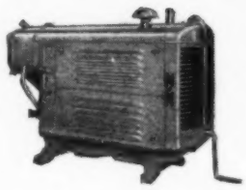

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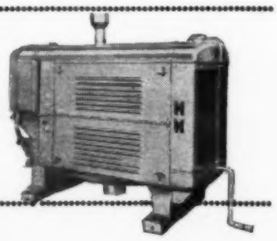

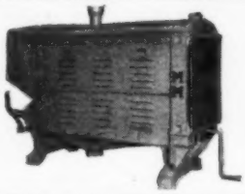

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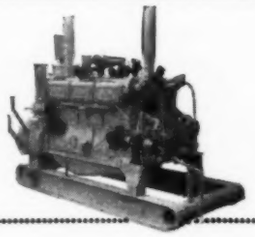

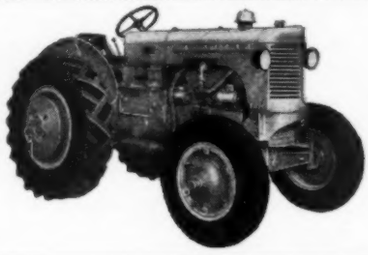

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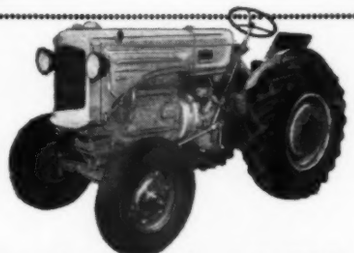

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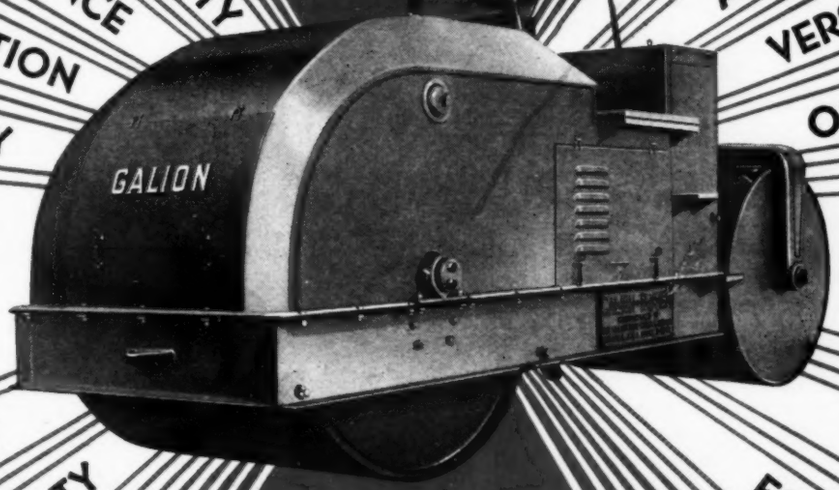

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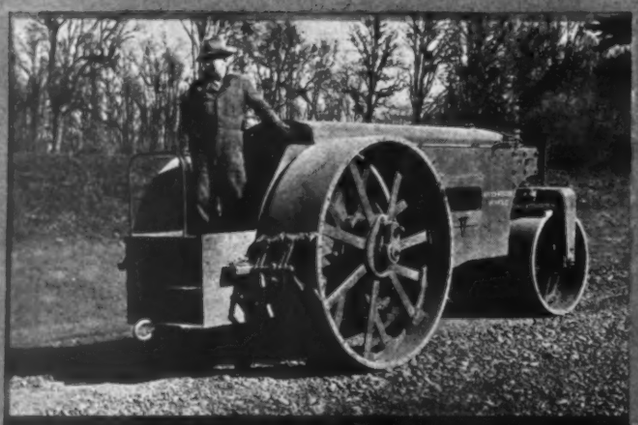

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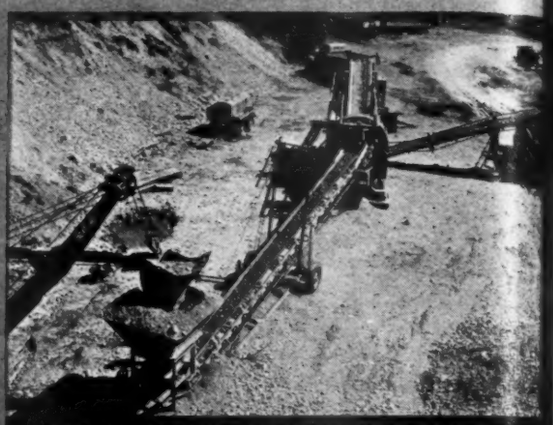

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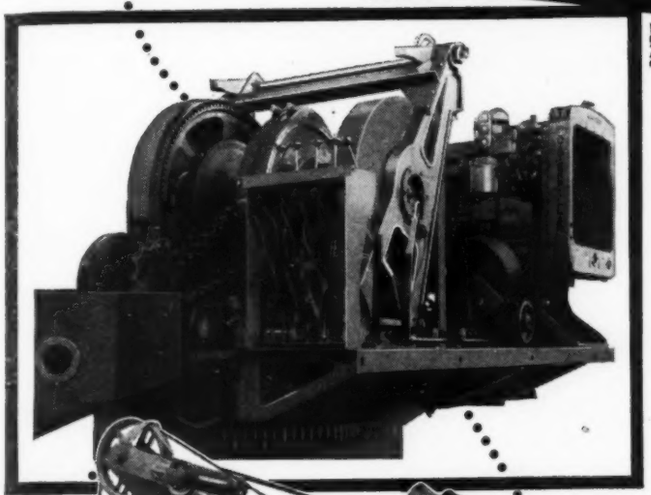

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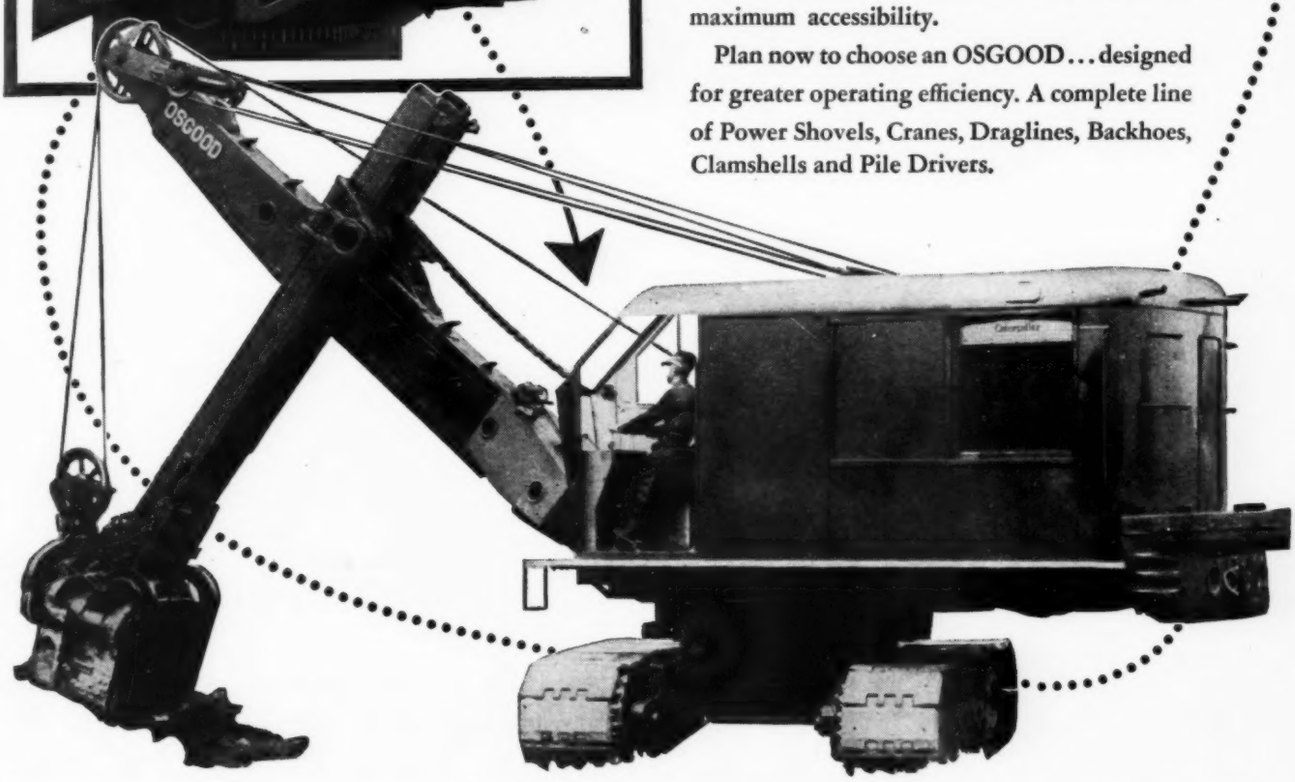

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Above: An International TD-9 Diesel Crawler with Dozer-Shovel is loading gravel on a wagon drawn by a modified International ID-9 Diesel Wheel Tractor.

On opposite page: An International TD-9 with Bulldozer-Shovel is shown loading rock on a truck in a quarry that supplies a crushing plant.

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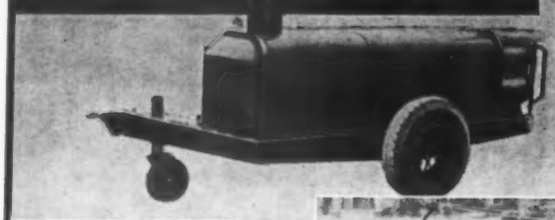

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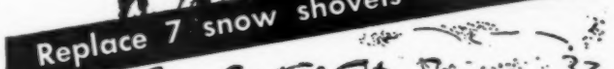
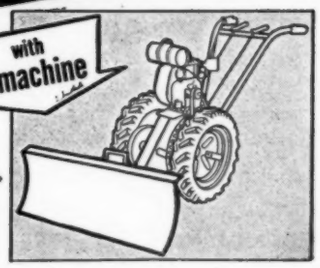


and 5 scythes next summer



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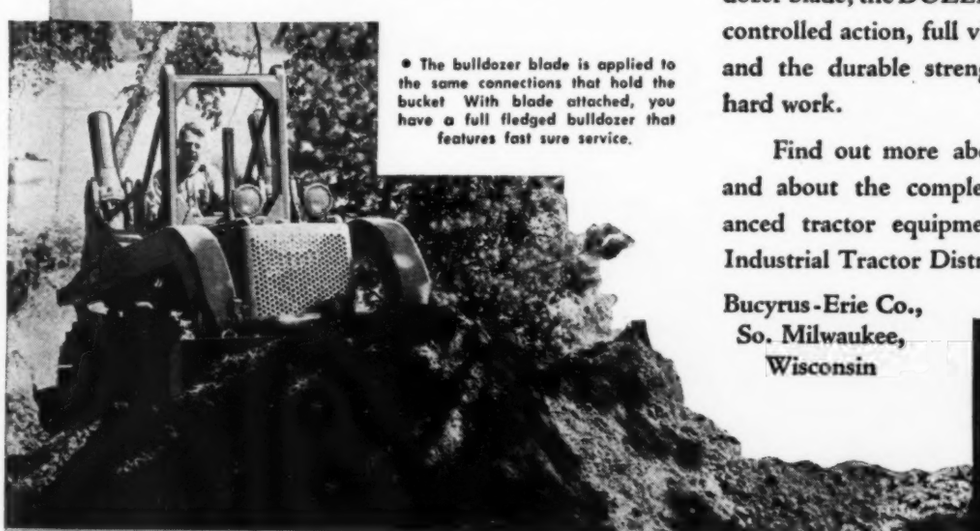

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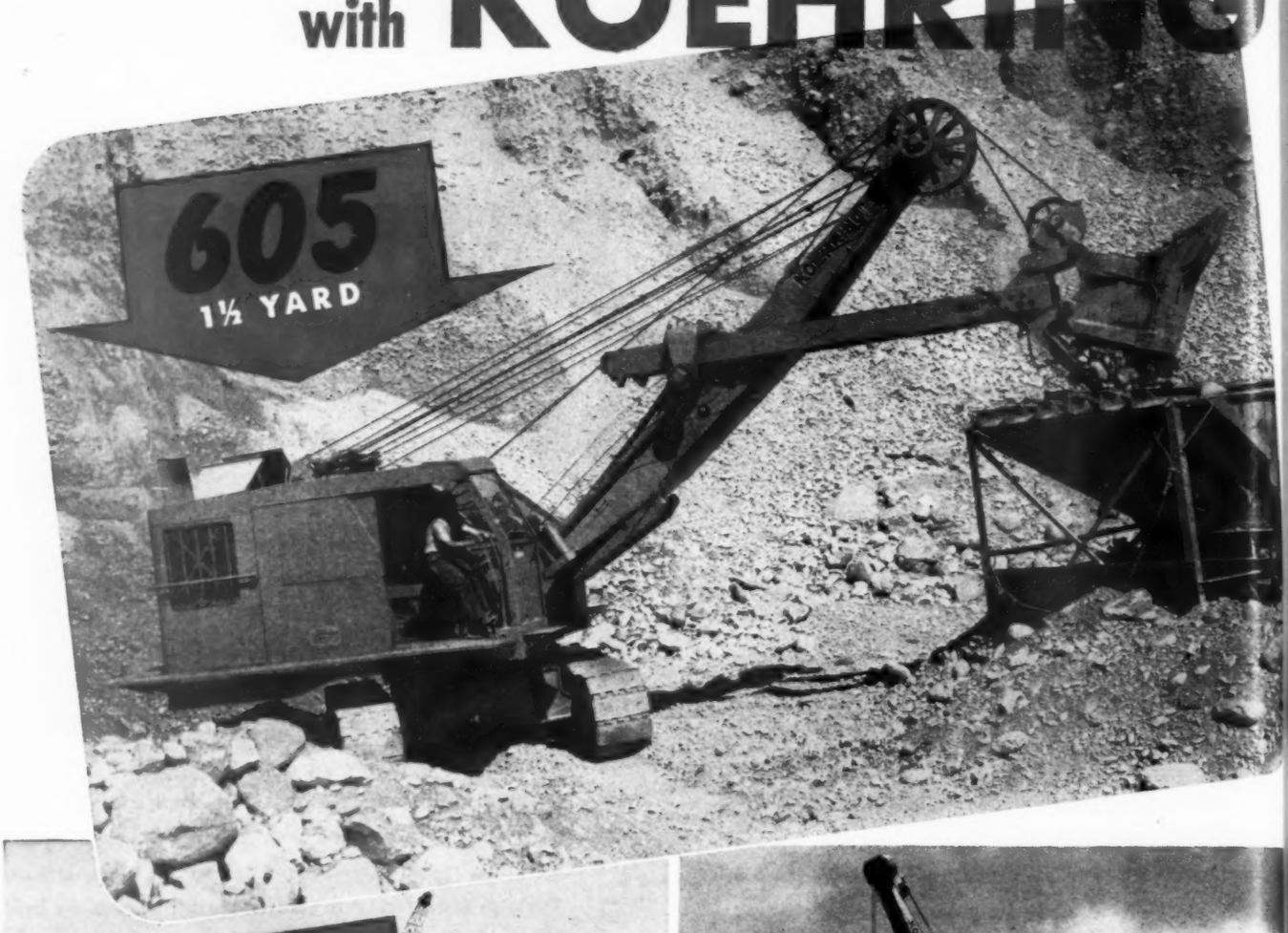

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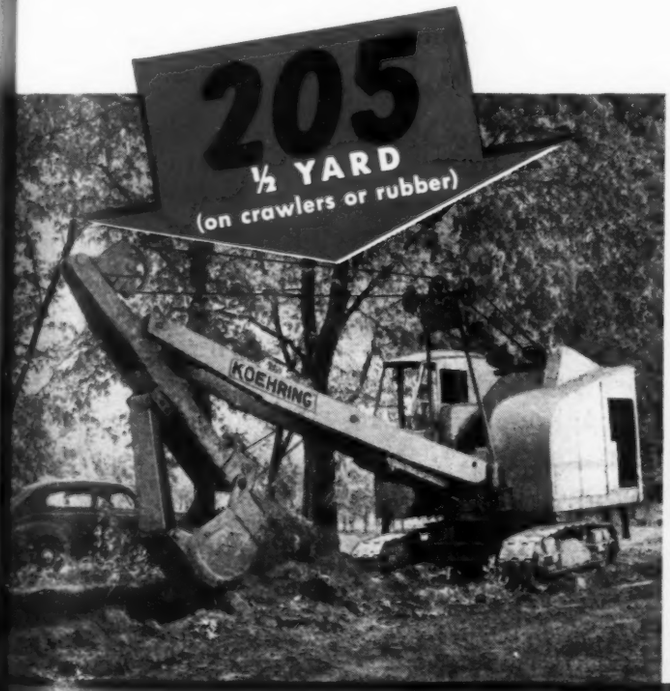

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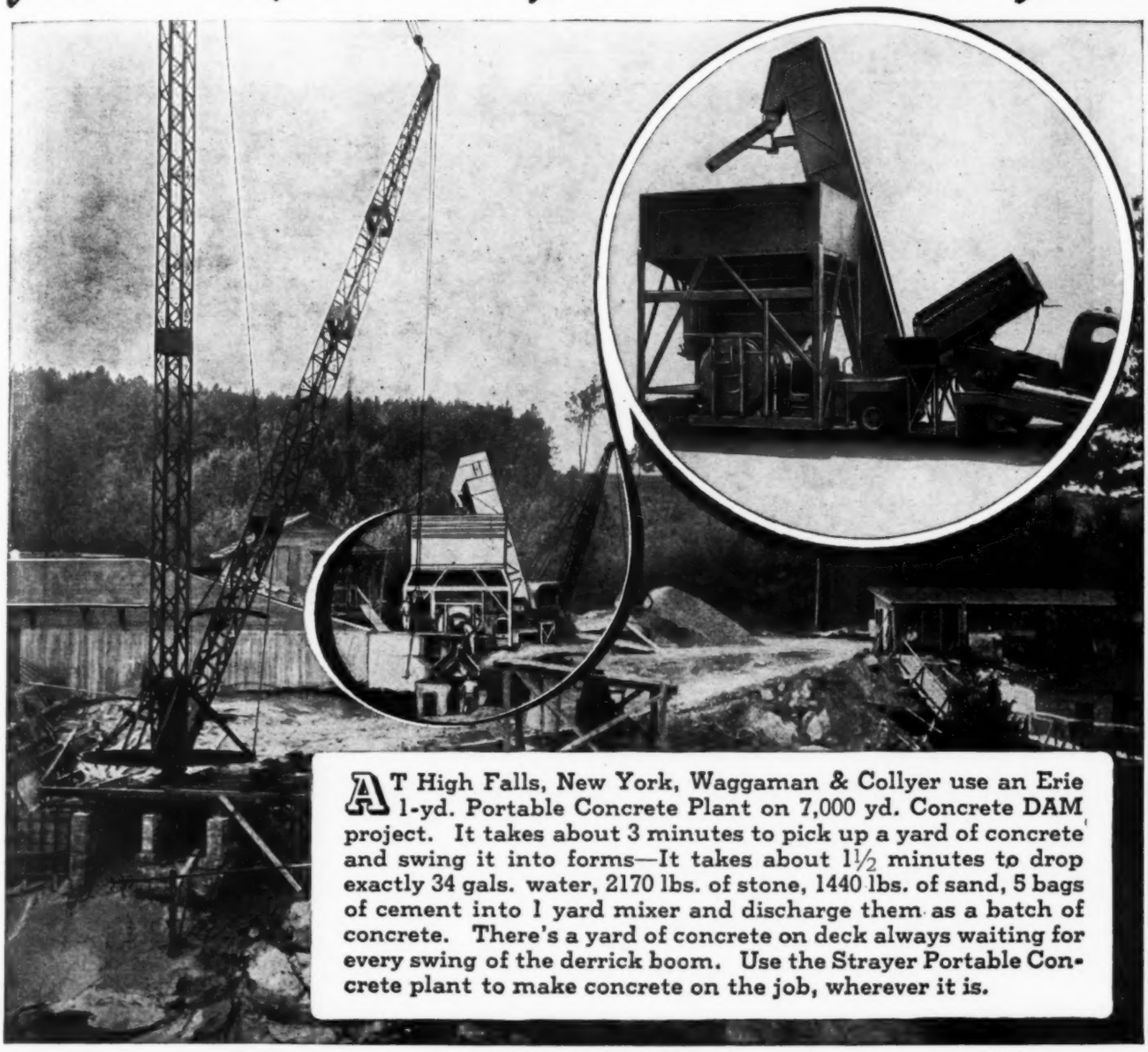

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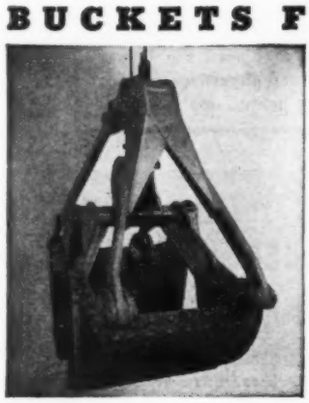

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ROADS AND STREETS

JANUARY, 1948 • VOL. 91 • No. 1

Twin Falls Airport

How it was Designed and Constructed

On-time completion of first airport approved under national airport plan, shows feasibility of federal aid for cooperative sponsor

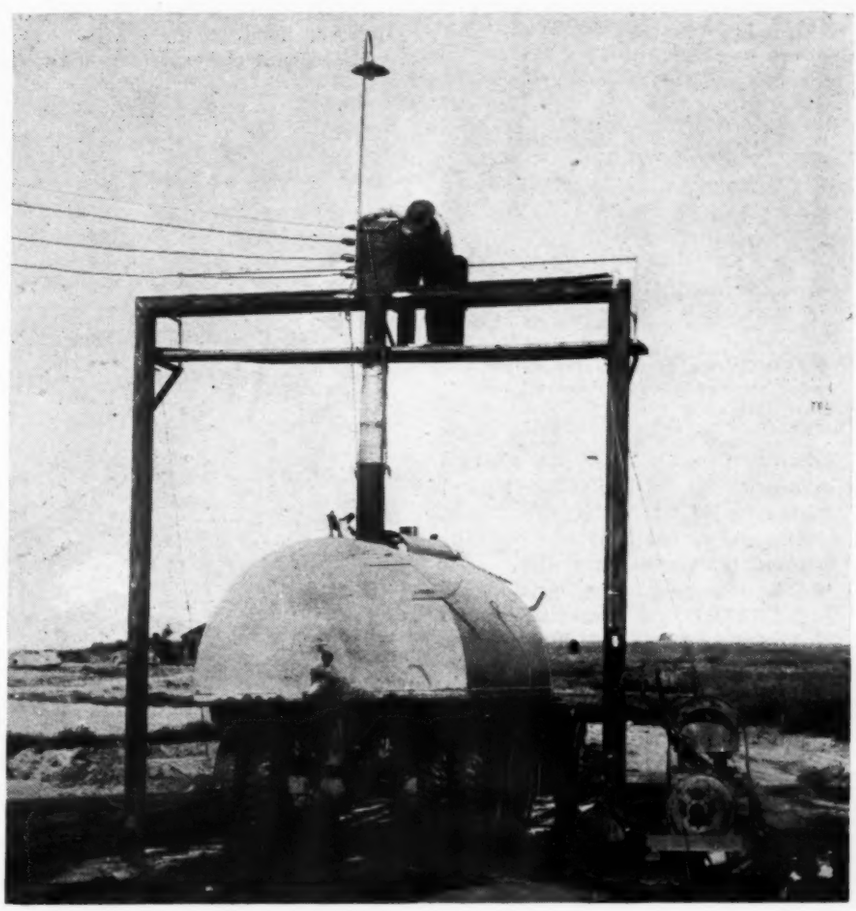
THE Nation's first approved airport under the national airport plan was recently completed to initial stage at Twin Falls, Idaho. The Triangle Construction Company of Boise finished the grading, drainage and paving to provide facilities for early commencement of United Airline's transcontinental service to Sun Valley, 60 miles north of Twin Falls. Located on the "wrong side" of the high-line irrigation canal which has changed this semi-arid sagebrush desert into one of Amer- garden spots, this Class III airport project involved some interesting construction and design features.

Proves Plan Workable

Activity on this airport largely refutes the contention that the current national airport plan is not workable. A large measure of the credit goes to the splendid cooperation of the city officials working through a well organized airport commission as well as the help of Chet Moulton, Idaho's State Aviation Director.

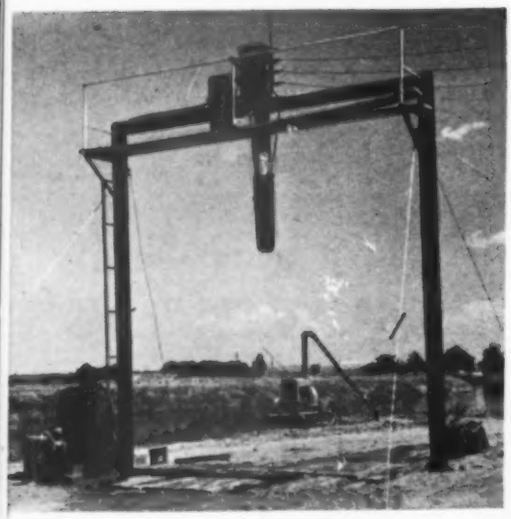
Twin Falls received its notice of tentative allocation amounting to $387,905 on Jan. 10, 1947. The plans and specifications received early Civil Aeronautics Administration approval and bids were opened on April 21. Triangle's low bid of $588,200 was accepted and they were given notice to proceed, effective May 29. Completion stipulated within 180 days.

Among the larger of 37 contract items were: 250,000 cu. yd. common



★ Water supply system with 90,000 gal. per hr, capacity was installed on an irrigation ditch at the airport's edge. Contractor-built frame consists of 8-in. welded pipe, 16 ft. high by 14 ft. wide. A 6-in. Rex self-priming centrifugal pump, operated by a 40-h.p., 3-phase electric motor, discharged into the frame which carried water up to telescope loading pipe. Man on platform operated switches and could load 2,500 gal. water tank truck in about 2 min.

★ (Upper): Soil was wind-deposited volcanic silt, E-6 by CAA classification, and easily moved with Triangle's modern equipment. Dust was a problem. (Lower): Specifications required 95% mod. AASHO density, necessitating close moisture control and careful rolling



★ Another view of the water station, better showing platform, ladder and other details

excavation at 37c; 1,000 cu. yd. rock excavation at $5.00; 41,000 cu. yd. subbase at $2.25; 125,000 sq. yd. 6-in. bituminous-coated base at 61c; 510,000 gal. emulsified asphalt at 15c; 10,500 tons asphaltic concrete at $4.50; 145,000 gal. asphaltic cement at 12½c; 8,000 cu. yd. ditch excavation at $2.25; and 12,037 ft. corrugated iron pipe, $44,081.

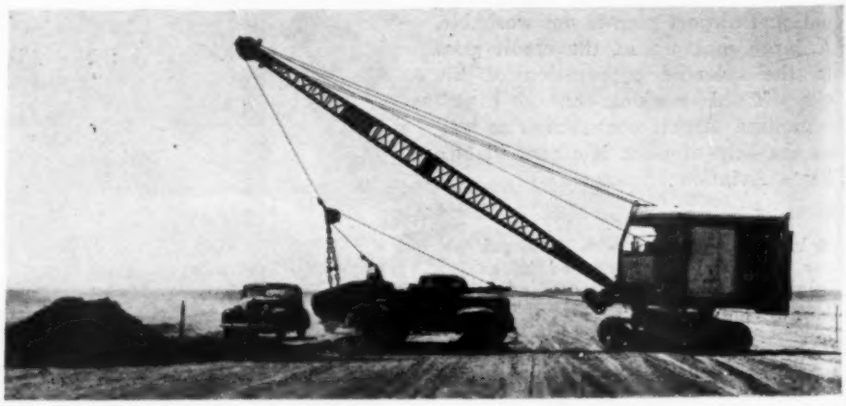
Master Planned for Stage Construction

Prior even to the inception of the national airport plan, Twin Falls started arrangements for financing the new airport. Taking advantage of state enabling legislation, the city imposed a 2-mill airport levy which has produced about $16,000 per year. Early in 1946 a bond election was held which carried, among other things, $250,000 for airport purposes. When CAA made their grant offer, 56.36% of estimated cost of $677,000 including administration building and lighting, Twin Falls had matching funds on hand.

Faced with the extremely high cost of irrigated land close to the city, a decision was reached whereby the airport was located 6 miles south of Twin Falls just above the high-line canal.

Sharing in the generally high prosperity of this farming community, the airport property has produced a crop revenue of about $3,000 per year. The off-landing strip areas will continue to produce a considerable amount as they can still be farmed.

Lacking weather observations of sufficient accuracy to allow compilation of a wind rose, this aspect of the airport layout required extensive study of local weather conditions. The opinion and observations of all credible observers, including local and airline pilots, were obtained and recorded. The concensus as to wind direction was easily reconciled with the channelizing influence which nearby mountains and the mountain-rimmed valley of the Snake River would exert on the prevailing westerly wind in this section of the Northwest. It was found that thermal effects from mountains to the south caused cold night-air to flow north toward the Snake as the mountains cooled more rapidly than the desert after sunset. As temperature gradiant between mountain and desert lessened during the day, the wind increased in velocity and veered to the west. By late afternoon the in-



★ (Upper): Airport was underlain with lava rock (basalt). Rock's depth below ground surface was unpredictable due to irregular nature of lava flows. Boulders and sharp declivities in the rock made borings necessary on very close spacing. Jackhammers were used to drill sporadic outcroppings. (Lower): Drag line (Link-Belt Speeder) excavated pipe trenches

★ (Upper): Rock and hardpan were encountered in many pipe trenches requiring much jackhammer work. About 13,500 ft of corrugated iron pipe were used in drainage system. Pipe sizes ranged from 15 in. to 42 in. and will function largely to remove snow water and infrequent flash floods. (Center): Cleveland rotary ditcher dug trenches for lighting duct. (Lower): Single-section sheepsfoot roller drawn by a small crawler (McCormick-Deering) took over backfill compaction as soon as hand tamping around pipe was completed

Nighttime southerly winds led to master planning of a southwest-northeast runway and provisions for a possible north-south runway.

Taking into account the type of aircraft which the airlines expected to use for scheduled operations, a class III runway was considered adequate for some time to come. A runway length of 4,900 ft. was necessary to compensate for the elevation of 4,200 ft.; 3,200 ft. was considered adequate for the class I runway.

Flexible Pavement Design

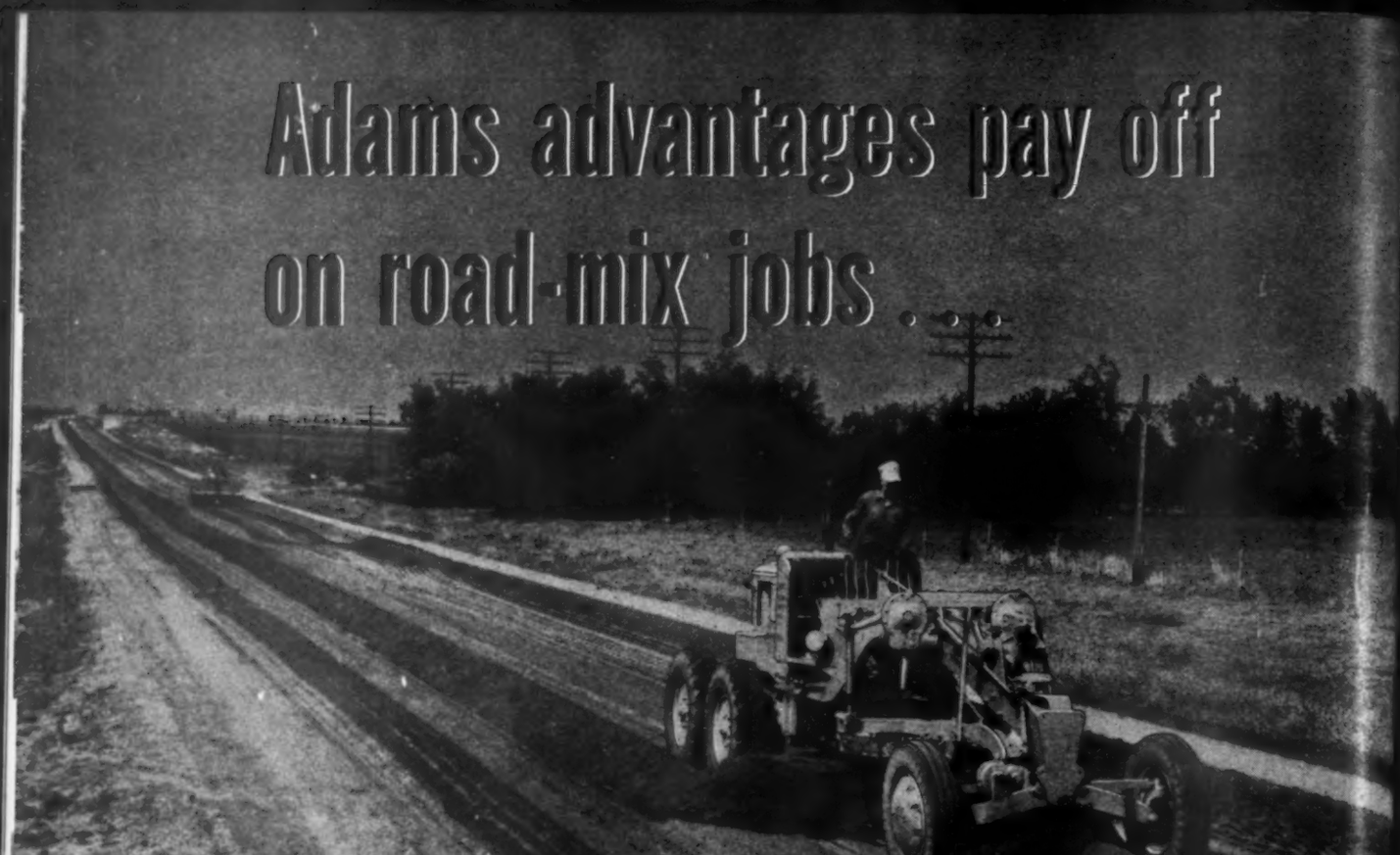
Standard CAA pavement design methods were used, based on a careful study of factors involved. The basic considerations were high initial cost of concrete as compared to asphaltic pavements in this area and the need to keep pavement costs within the funds presently available while making due allowances for higher wheel loadings to come. Pres-

fluence of the river valley was often sufficient to cause the wind to become northwesterly.

The predominance of westerly winds during daylight hours and the low velocity of southerly night winds indicated that the first main runway should be east-west. The prevalence of daytime **northwesterly** winds led to the decision to build a class I runway in this direction for light-plane use. This runway was designed as the first stage of a longer runway should operational experience warrant its construction in the future.

★ Air-operated tamper mounted on crane, working somewhat in pile-driver fashion, finished compacting trench backfill in many instances

Adams advantages pay off on road-mix jobs . . .



ROAD-MIX WORK—to be fast, efficient, economical—calls for motor graders with the combination of operating advantages found only in Adams Motor Graders.

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ent wheel loadings were estimated at 30,000 lb.; ultimate of 74,000 lb. assumed.

The soil in this section of Idaho is wind-deposited silt underlain with basalt at varying depths. Soil tests showed the loess to be in the E-6 CAA classification or A-4 according to PRA. It was contemplated that good drainage would be incorporated in the design and severe frost conditions were known to prevail.

CAA grading specification P-102 was used requiring 95% of modified AASHO density to a depth of at least 9 in. below subgrade and for all fills. Subbase was specified 6-in. thick for the main runway, taxiway and apron; 6 in. for the lightplane runway and apron. Material was required to meet standards given in CAA's Design Manual for class III and larger airports.

Mixed-in-place base course, in accordance with CAA spec. P-204 using emulsified asphalt, was placed 6 in. thick on the prepared subbase. The scarcity of crushed aggregates in this lava-flow country largely accounted for the choice of bituminous coated base. The base course for the light-plane runway was reduced to 3½ in. All base course was given a light shot of bituminous tack coat (CAA spec. P-603).

A basic thickness of 1½ in. of dense-graded hot-mix asphaltic concrete topping (spec. P-401) was specified. Runway ends, warm-up areas and the apron were surfaced 2 in. in accordance with CAA policy of reinforcing pavements subjected to vibrational stresses. All surfaced areas were seal coated under spec. P-604.

★ Hot plant (Madsen) was set up on R.R. siding in Twin Falls, 6 mi. distant from airport. Plant averaged 65 tons per hr.

★ Seal coat aggregate was produced 35 mi. distant and stockpiled on the site

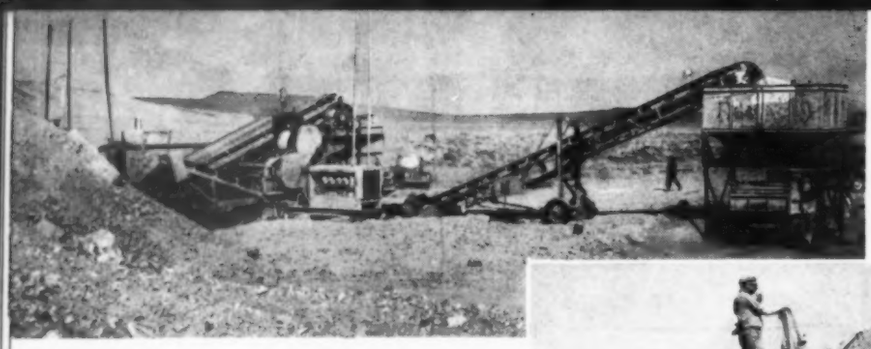
Double Surface Treatment

The class I runway was given a double surface treatment (spec. P-609) in lieu of the hot-mix, and was paved only 100 ft. wide. The east-west runway was paved 150 ft. and the taxiway 50 ft. wide.

The thinking in regard to future strengthening of these two pavements was that the main runway could be brought up to 74,000 lb. capacity by the addition of about 2 in. of hot-mix. The class I pavement will be widened and thickened by adding a 3½-in. lift of emulsified asphalt base and up to 3½ in. of plant mix, should this prove necessary. The pavement has been designed so that the strengthening can be accomplished to any desired degree without wasting any existing pavement. The only changes which will be required are the raising of drainage inlets and regrading shoulder areas adjacent to the pavement.

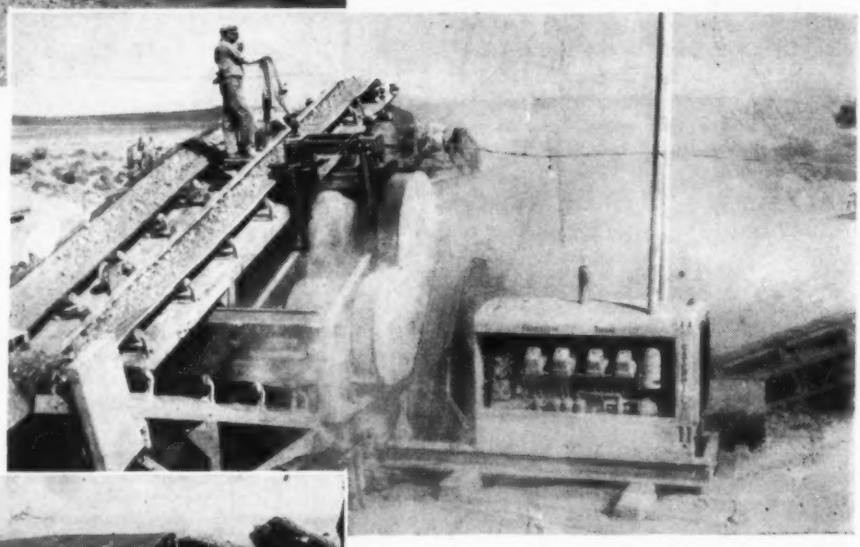
The use of standard rainfall tables and CAA drainage design formulae resulted in pipe sizes large enough to somewhat astonish the local ex-

★ (Left): Class I runway and light-duty apron areas received double surface treatment of HV emulsion and ½-in. chips. J. C. Compton designed pressure distributor to his own liking. Distributor features Walker no-drip spreader bar, Stewart Warner tach, V-belt drive and boot man high above dust and oil. (Right): Wobble wheel roller was used to roll surface treatment and seal coat aggregate



★ Pit-run gravel used in emulsified asphalt base had to be crushed and screened to meet specified gradation. This Triangle-assembled plant produced as much as 1,087 cu. yd. per 8-hr. day. Pit material was bulldozed or trucked into hopper at left

★ Diesel motors operated primary and secondary crushers. Note guyed air intake pipe extending above dust area surrounding crusher



★ Diesel engine-generators supplied electricity for motors driving belts and gears. Portable house in foreground housed transformers and controls. Goggled and masked workman stationed on crusher regulated conveyors to prevent clogging and could shut plant down instantly in case of trouble

★ Base course material was windrowed in place on finished 7-in. subbase. (Hercules dump body.) About 5% of emulsified asphalt was used to give aggregate bituminous coating and was laid in two 3-in. layers

★ Woods travel-plant mixer processed about 140 cu. yd. per hr. of base course

perts. However, taking into account the unstable nature of saturated local soil and run-off conditions prevailing during periods of melting snow and frost, a formal drainage system was considered to be cheap pavement insurance. Surface water from the east-west runway will be collected in pavement-edge gutters and removed by inlets spaced about 400 ft. apart. The shallow depth to rock indicated the economy of minimum cover and accounts for the exclusive choice of corrugated iron pipe.

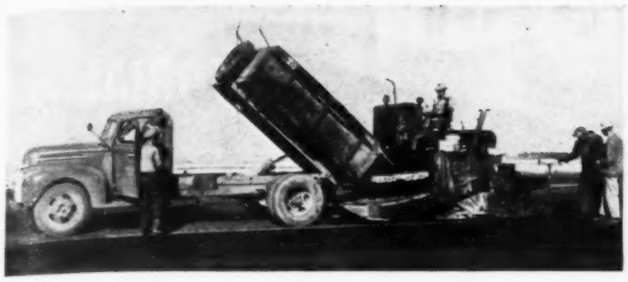
Contractor Problems:

Time—and Water

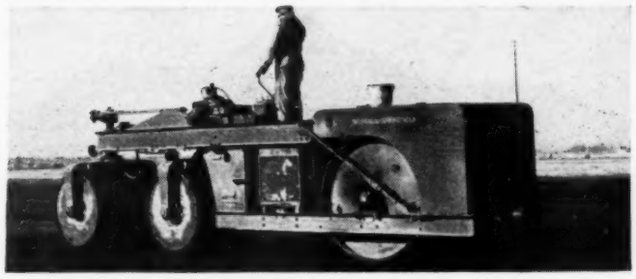
While Triangle had 6 months in which to complete all items, autumn weather conditions around Twin Falls cannot be relied upon to be favorable for paving and grading. Skillful handling of adequate equipment, careful scheduling of concurrent operations and a break in the weather allowed Triangle to fool the experts who predicted a carry-over job. At that, it was nip and tuck when the weather started getting bad early in November with a week's work remaining to be accomplished.

The prevailing wind-laid silt required careful control of moisture content and rolling in order to obtain density. High winds made a dust control problem.

Triangle's water supply system appeared to be as efficient as one could possibly be. The source of water was the high-line canal at the north airport boundary. As shown in the accompanying photographs, an 8-in. welded frame, plugged at the bottom,



★ Barber Greene finisher laid 1½-in. surface course



★ Specified surface course density of 95% and ⅜ in. surface tolerance required careful rolling. (Buffalo-Springfield)

carried water to the telescope loading pipe as well as providing a platform for the operator and a mounting for electrical controls. The 6-in. Rex self-priming centrifugal pump delivered enough water, without a storage tank, to allow a 2,500-gal. water truck to be loaded in 2¼ min. The tank trucks were loaded on a grated platform provided with a drain pipe which kept the loading area from becoming muddy or slippery.

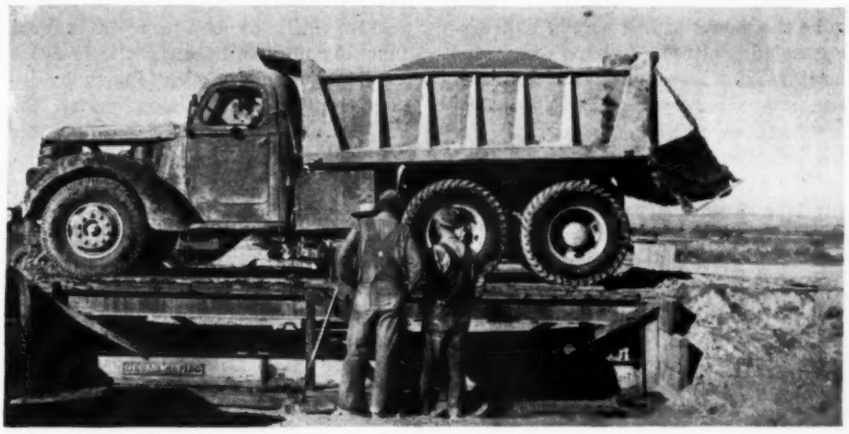
Triangle used water generously on their haul roads. They also made it a practice to apply water to the cut areas. Added moisture to the extent of about 10% was required to bring the fill material up to optimum.

Trenches Delayed Pavement

The fact that the east-west landing strip had 10 large-diameter pipe crossings and 6 duct crossings made it difficult to crowd the pavement work closely behind the grading. To prevent possible settlement of ditches under the pavement, 100% of mod. AASHO density was specified for all pipe backfill. Cooperating completely, the contractor hand placed the backfill material in thin layers which were meticulously tamped at optimum moisture. Hand-operated air tools were used around the pipe and until it was covered about 6 in. A small International tractor then took over, pulling a single section of sheepsfoot roller. Excellent compaction was also secured by the use of an air-operated tamper which was tripped by an operator on the ground. Bud Smith, Pres. of Triangle, described this tamper in glowing terms.

As soon as a workable stretch of runway was ready, subbase material was placed by dump trucks and spread by motor patrols. A specified surface tolerance of ⅜ in. variation in 16 ft. required careful blading.

Aggregate for the bituminous-coated mat was produced from a gravel pit 7 mi. from the airport. Crushing and screening were necessary in order to comply with the gradation specifications. A reject screen proved to be necessary to keep the 200-mesh material below 8% upper limit. Triangle used a variety of makes of equipment to assemble the crushing plant shown in the accompanying photographs. But Smith describes it as a 3-unit triple-roll outfit. The primary crusher consisted of a Pioneer 24-36 breaker jaw, the secondary was a Universal 10-36 jaw and the third unit was a Pioneer triple roll. This outfit produced an average of 1,500 cu. yd. per 2-shift day. Best 8-hr. run was 1,087 cu. yd. By carefully controlling the fines, the emulsion content was kept to less than 5%.



★ Cedar Rapids scales were installed on airport to weigh surface course and seal coat aggregates

The base course material was windrowed in place and processed in 2 equal layers with a Woods travel-plant mixer. Slightly over 1,000 cu. yd. was handled in an 8-hr. day. Again, the ⅜-in. surface tolerance called for careful blading. The 95% compaction was easily obtained by combined sheepsfoot and steel-wheel rolling. Ordinary procedure was to blade out a 1 to 1½-in. layer as soon as the emulsion had broken sufficiently. A wobble wheel roller compacted each such layer. When the entire windrow had been thus spread, a steel-wheel roller was used to iron out the surface and give it the final compaction. The contractor elected to use emulsified asphalt tack coat.

Triangle was fortunate in having semi-portable hot plant set up at Twin Falls as a hangover from a state highway job. This plant, a Madsen, averaged 65 tons per hour. Aggregates were produced by Duffy Reed at point 35 mi. from the plant. The surface course was laid by a Barber Greene finisher, thoroughly rolled, and then given an RC-2 asphalt seal. Luffy Reed also produced the seal coat and surface treatment aggregates. Cedar Rapids scales were installed at the airport to weigh these aggregates as they came from the airport stockpiles.

While Bud Smith visited the job frequently, Richard Farnsworth, general superintendent, handled the job for Triangle. Mayor Herb Lauterbach, ex-army engineer colonel, devoted a great deal of time to the job. Engineer Services of Boise was the sponsor's engineer. J. C. Compton handled his company's share of the work.

●

First Virginia Road School—With an attendance of approximately 600 the first Virginia Road School was inaugurated at Lexington, Va., on Oct. 31 and Nov. 1. The school was under the sponsorship of the Virginia State Highway Department and the Virginia Military Institute.

EDITORIAL

★ About Them Road Forms . . .

Pardon our English, but this seems to be the most natural way of expressing an admonition. Perhaps some contractors don't realize that careful handling and systematic off-season overhauling of road forms pay. Or maybe they realize this, but don't know that their employes are still yanking forms loose from the new slab without taking the trouble to pull pins first. Believe it or not, this is still happening in this enlightened day when the average paving contractor has a tidy sum invested in his road forms.

Also still to be seen on a cool morning now and then is the practice of lifting the unstaked forms by inserting the crane hook under the tread, instead of getting under the stake pockets. Bad for alignment. Means hand labor in straightening, and maybe rejection by the inspector, or early to the scrap heap. Forms tie up about as much dough as a paver. Why a contractor will lavish loving care on his paver and let Yanking Joe take his exuberance out on his forms is a mystery for the psychologist, unless it is that anything with a motor in it is bound to get more serious maintenance attention because it will conk completely otherwise.

While on the subject of forms, why doesn't some bright lad invent a form-riding bridge machine that can be used to pull (or set) form panels as it travels? The setting, taking up, handling and transporting of forms use up a lot of man-hours compared to other more streamlined parts of the concrete paving job.

★ Watch Truck Overloads!

Only recently have highway engineers come to realize fully how quickly a roadbed or pavement can be damaged by heavy axle loads. The war experience brought this fact to the fore to the tune of hundreds of millions of dollars in accelerated highway destruction. All types of pavements suffered.

Yet some states continue to be lax in loadometer checks and in the general enforcement of axle load limits. Truckers watch officials like hawks, and, at times seem to have no conscience in their efforts to out-flank enforcement attempts.

Two papers given at the recent Highway Research Board meeting provide a fresh reminder of the importance of matching the road with the upper-bracket load. In Indiana one researcher points out that pumping and other troubles on concrete roads are traceable in a great measure to the heaviest 1% of the traffic; that where no loads exceeding the design axle maximum are carried, no pumping occurs. As simple as that.

And in Texas a planning survey engineer urges that compilers of traffic and planning survey data give greater attention to loads and classification of traffic. Texas is resuming systematic monthly load-checks on a state-wide scale. Such checks are needed continually in all states, as a source of design data and as an enforcement aid.

★ City F. A. Work Lagging

City highway improvements are lagging behind other phases of the huge postwar Federal Aid program, recent Public Roads Administration figures show. This isn't cause for alarm when you stop to consider the reasons. First, some of the figures:

Only 17% of Federal funds available for these urban improvements were represented by awarded contracts, up to the date of this review, while the percentage for primary roads is 40% and the percentage for the secondary-road system 33%.

Only one per cent of these urban funds represented completed contracts as of October 1, while the comparable percentages were 10% for the primary roads and 11% for the secondary roads.

The slower rate of progress for the urban projects is attributed to the greater amount of advance planning required, difficulties inherent in securing rights-of-way in cities, and in some cases to the necessity for advance arrangements in financing.

The general picture on Federal-aid as of October 1 was that 32% of the funds apportioned to the states under the 1944 Federal Aid Act were under contract, for a dollar amount of $471 million. After state matching of Federal grants, this figure enlarges to $934 million. Projects already completed accounted for $118 million of the Federal funds. Projects actually under construction account for another $304 million.

As of the same date—24 months after the first funds were made available to the states—$546 millions in Federal funds was not programmed and was still available for new projects. Now that much of the preliminary work is done, we should see increasing speed in states and cities that really intend to do something about a long-range cure for their urban traffic congestion.

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Soon you'll see the great new line of Ford Trucks—great not only because they are *new all through*, but because they are the amazing result of a time-proved truck building principle.

This principle is Ford Bonus Built construction. Here's what it means to you:

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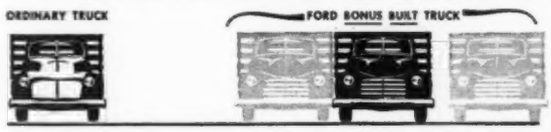
First, these Bonus Built WORK RESERVES give Ford Trucks a greater *range of use* by permitting them to handle loads beyond the normal call of duty. Ford Trucks are not limited to doing one single, specific job!

Second, these same WORK RESERVES allow Ford Trucks to relax on the job . . . to do their jobs with less strain and less wear. Thus, Ford Trucks last *longer* because they work *easier!*



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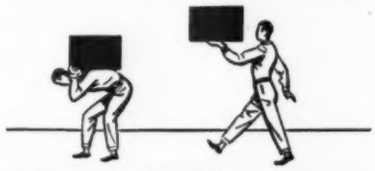

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***BONUS:** *"Something given in addition to what is usual or strictly due."—Webster's Dictionary.*

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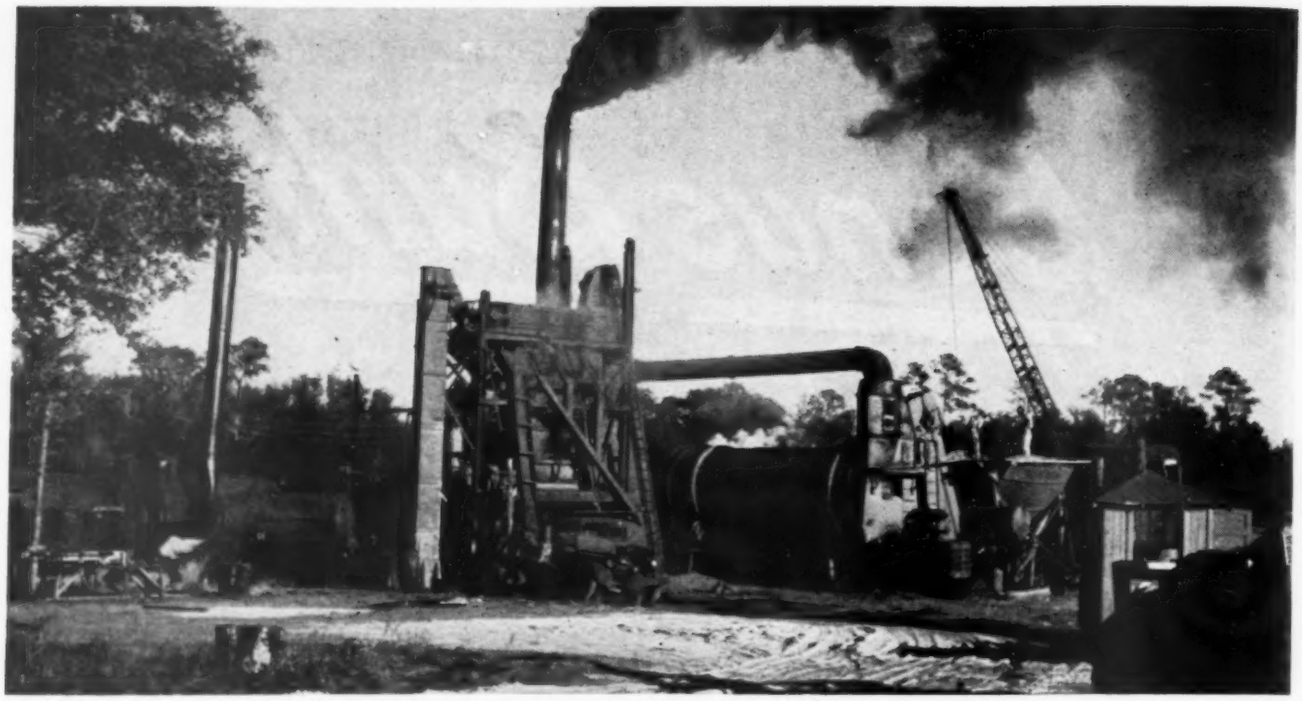


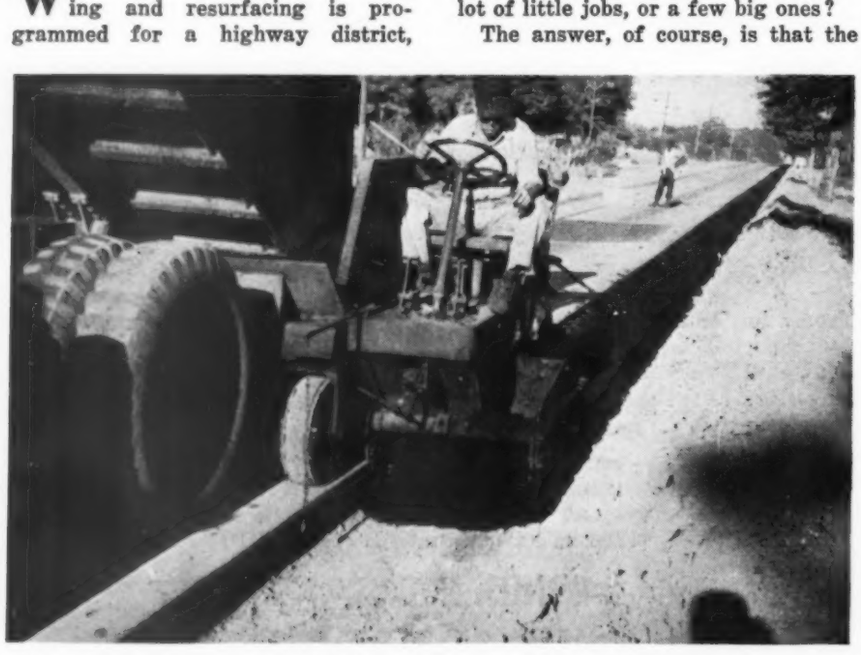
★ One of the hot-mix plants, each of which turned out as high as 1,000 tons daily of sand asphalt widening mix

67-Mile Hot-Mix Contract

Supplied from two plants, each with 4 set-ups, this $900,000 northern Florida project demonstrates the contract economy of large, steady runs

WHEN a large mileage of widening and resurfacing is programmed for a highway district, should the work be broken up into a lot of little jobs, or a few big ones?

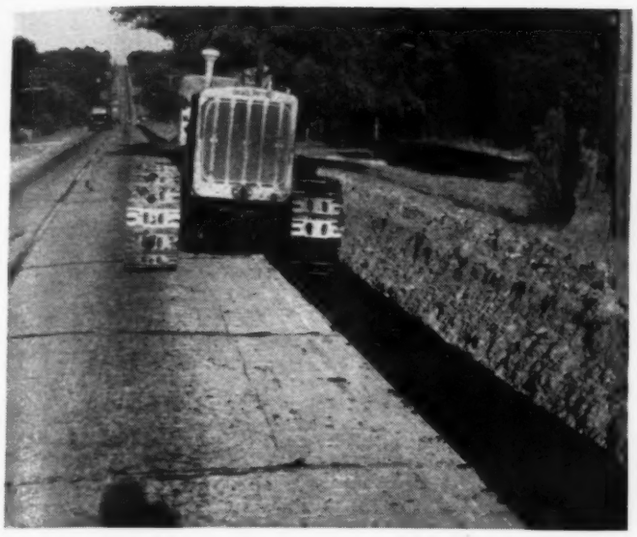
The answer, of course, is that the highway department must let the work to give the motoring public the best deal possible. In a good many cases throughout the country since the war lowest bids have resulted when a large volume of work has been set up for a single bid. Granting that asphalt and aggregate plants these days are designed for mobility and quick, economical moves, it still costs a contractor more money to shuttle his equipment all over the state each year, which he must often do in an effort to keep busy and charge off his outfit against a good steady season.



★ After blading the trench, sand-asphalt mix was placed thusly, using a special box built on end of finisher

6 Parcels Let Together

Having let fly with this burst of solemn philosophy, we'll tell you briefly about a nice layout of work that Smith Engineering and Construction Co., of Pensacola, bid off late in 1946 around Tallahassee. This extensive job was bid at $940,745 which was well under the estimate. The unit prices possibly reflect a leveling off and slight softening of construction costs in this area, but main-



★ First compaction passes over sand-asphalt were made with smooth tractor track

★ Several additional passes with a trench roller brought the mix to specified density

ly they are believed to be due to the favorable set-up. The contracting firm, by the way, is headed by Charles W. Smith, vice-president of the American Road Builders' Association and a national and state leader in contractor affairs, as well as the head of one of the South's larger contracting concerns.

The contract includes 67 miles in six parcels (ranging from 2.6 to 16.7 miles), located on roads fanning out in three directions from Tallahassee. The work consists of widening 18 or 20 ft. concrete pavement with 2 or 3 ft. strips of sand-asphalt on both sides and applying two courses of hot mix the full 22 or 24 ft. width, the details varying from section to section.

★ How the finished widening strip appeared, ready for full-width resurface

Simple Procedures

The widening procedure was as follows:

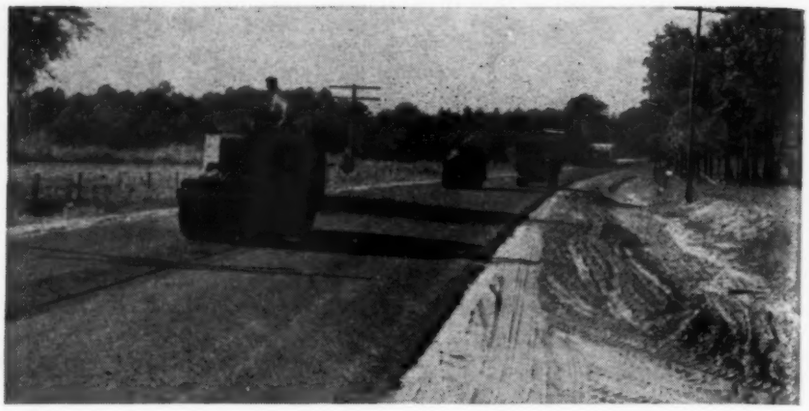
★ Eighteen-ton diesel trucks simplified delivery and placement of the resurface mix

(1) Sandy clay or clayey sand shoulders were trenched using a grader with a special drop blade. Trench excavation was used to dress shoulders and ditch slopes. Trenches were not rolled.

(2) Sand asphalt hot-mix was placed in two 4½-in. compacted layers, without forms. The mix was dropped neatly into the trench through a hopper built out from one end of a screw-feed spreader box.

(3) Sand asphalt layers were each compacted initially by passing a D6 crawler tractor over it two or more round trips, one track on the pavement and the other over some portion of the widening strip. A trench roller supplied the final compaction in 4 or more passes. Density tests were taken daily. (Florida state specifications heretofore haven't required a trench roller because such machines were not readily obtainable; it is understood the highway department is now considering compulsory use of

★ Sam Register, state road department project engineer, with John Long of the Florida Road Builders' Association



★ Putting the finishing touches on a section of binder course

★ How the Smith firm housed a diesel generator unit at one of the plants

★ Southern type shop serving a hot-mix plant

trench rollers on such widening in the future).

The resurface was a routine operation which a skilled crew was able to gear up to as high as 1,000 tons or 8,000 ft. of 12-ft.x1½-in. binder course per day, using a single mechanical spreader. Slag aggregate was employed in the 1½-in. binder course and the 1-in. top course.

The practice was to get out at 7 a.m. each working day with a 500-gal. distributor and apply a tack coat over the expected day's run.

18-Ton Diesel Trucks

Mix was placed half width at a time under traffic. As was the case with another large Florida contractor (Duval E & C Co.; see Nov. '47 R&S), the Smith firm delivered mix in 18-ton diesel-powered dump trucks. In general, three such trucks were kept busy on widening and five on surfacing. Hauls averaged about 8 miles, ranging occasionally to 18 miles from the various plant locations. Two tandem rollers, 8 and 10 tons, were used.

The mixes were produced in a portable (Simplicity) asphalt plant and from a plant comprising a Cedar Rapids asphalt plant and Simplicity oversize dryer of 70 t. per hr. capacity. While nominally rated at 600 tons per day, these plants were able to turn out as high as 1,000 tons daily of sand-asphalt, as noted, and averaged between 500 and 600 tons allowing for shutdowns for all reasons.

Estimated quantities and bid prices (let Oct. 17, '46) required for the six sections were as follows:

103,425	gal. paint or tack material (RC-15)	0.09
63,781	tons hot binder course mix	4.53
44,758	tons hot surface course mix	4.37
179,466	sq. yd. 9-in. sand-asph. hot mix widening	1.07
19,230	sq. yd. 6-in. sand-asph. hot mix widening (for intersections and turnouts)	0.73
1,425,180	gal. bit. material (AC-8) for sand asphalt	0.075
825,386	gal. bit. material (AC-8) for binder course	0.075
789,841	gal. bit. material (AC-8) for surface course	0.075

The project is part of the Florida state road commission's program, F. Elgin Bayless, chairman; E. C. DeGarmo, state highway engineer; G. L. Dickenson, division engineer at Chipley, was in immediate charge, with Sam Register, project engineer. R. J. Hammons & Albert Taylor were project superintendents.

What Is an Engineer?

An Engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulae calculated with micromatic precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to all too frequently as Engineers.

On second thought, we will say the description could be improved by the judicious insertion of a few periods.

Source? Darned if we know. —Ed.

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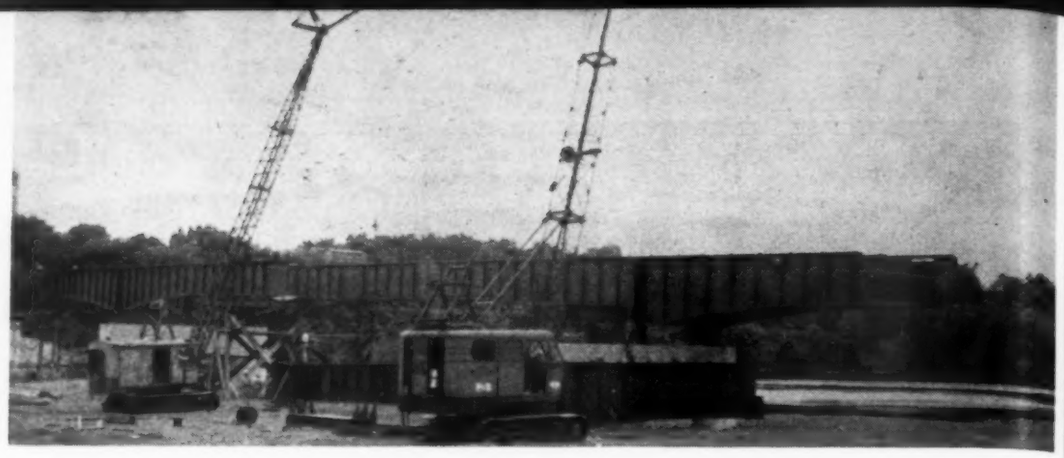
BLACKHAWK *Hydraulic* **EQUIPMENT**



★ Two cranes set the first half of the steel from the ground. A stiff-leg traveling on top carried the job across the stream and to the far end

Erecting Cantilever Bridge

L. G. Arnold, Inc., used special gantry two crawler cranes and a stiff-leg to make speedy work of 710½-ft. Wisconsin bridge

A FIVE-SPAN deck girder highway bridge was completed during 1947 at Eau Claire, Wis., this $380,000 structure over the Chippewa River being financed jointly by the state, county and city. The bridge is 710' 6" long and has a 30-ft. roadway (with cantilevered sidewalks) all supported by three lines of girders. Spans are 129, 144, 164½, 144 and 129 ft. measured from pier centerlines. The 144-ft.-span girders, each cantilevered to a total structural length of 221½ ft., supporting an 88½-ft. suspended girder over midstream and 88½-ft. girders at either end. The longest shop-fabricated section was 110 ft. in length and weighed 30 tons.

Bethlehem Steel Co. at Chicago fabricated the job and shipped steel to a 3-car rail spur located at the contractor's plant one-half mile from the project. Here cars were unloaded by a special gantry. The gantry (see photos) consists of two pile bents supporting a pair of salvage I-beams, which in turn act as a bridge for a pair of old rails mounted on stringers. A freight car truck functions as a traveling crane, from which is suspended a heavy hand-operated chain hoist and cradle support.

Each girder was lifted, the flat car shunted from under, and the steel set on a truck-trailer-dolly unit for hauling to the site. The dolly unit was fashioned from the trucks of a 45-ton army tank retriever.

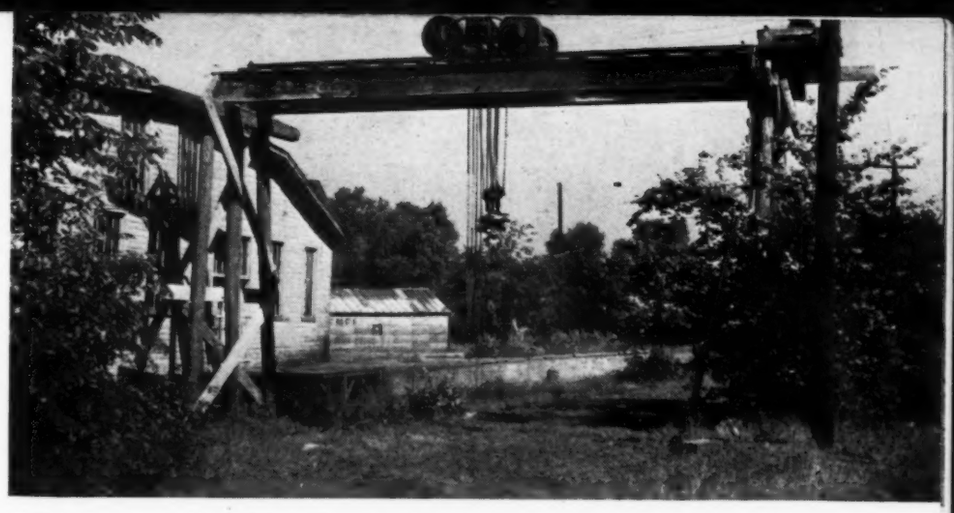
At the bridge steel for the first two spans was unloaded and set with two

★ Additional scenes during steel erection, showing type of equipment and structural features of the bridge

crawler cranes operating on the ground—one a 2-yd. or 25-ton P & H with 65-ton boom and the other a 1½-yd. Northwest with 65-ft. boom and 15-ft. jib. Steel setting proceeded from one end. A stiffleg set on falsework needed for erecting the mid-suspended span and field splicing the far cantilever span. The stiffleg set the far cantilever and went on through, setting the far-suspended span as well as mid span.

Pier foundations were built with open sheeting and tremie-sealed after driving wood piles 3 ft. to rock. A 6-in. pump took care of dewatering, and a contractor-built air lift pump was employed for removing sand and silt after driving piling. Concreting of piers, abutments and the 6-in. concrete slab deck were performed with a stationary 27-E paver set-up, supplied by a batch plant near the job and feeding into a drop bucket for placement in the case of structural concrete.

L. L. Arnold was in charge for the contractor. Floyd E. Burill was resident engineer for the Wisconsin Highway Commission. The project was planned, designed and contracted by the Commission, E. L. Roettiger, state highway engineer, C. H. Kirch, bridge engineer, and W. F. Baumgartner, division engineer.



★ Flat cars were unloaded by a home-made gantry located at the end of the contractor's RR spur

Meetings Ahead

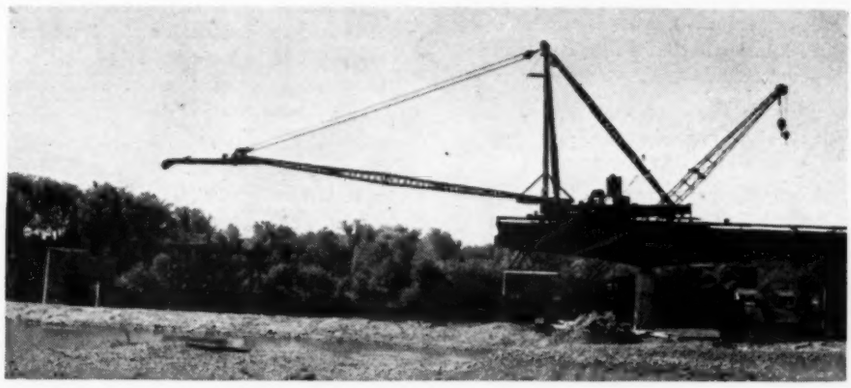
American Road Builders' Association—annual convention, Washington, D. C., Jan. 26-28. (1948 road show July 16-20, Soldier Field, Chicago.)

Associated General Contractors of America, Inc.—29th annual convention, Dallas, Texas, Feb. 9-12, 1948.

Associated Equipment Distributors —Annual meeting, Edgewater Beach Hotel, Chicago, Ill., Feb. 15-19.

●

Highway construction work in Illinois today is supported by an excellent state right-of-way law, passed last summer. This bill amends the eminent domain act and authorizes the state to acquire title to any real property for highway purposes immediately upon filing a declaration of taking, signed by the governor or his agent, and upon payment into court of the estimated compensation for the property. The state is then entitled to immediate possession, and need not wait for final adjudication as required in other condemnation proceedings. In hardship cases the court may postpone right of entry for not more than six months.



★ Stiffleg setting falsework for erection of mid-stream suspended span

★ The trailer and dolly employed for trundling the girders to the site—dolly from an Army tank retriever

Why Pre-Qualification?

Advantages of Pre-Qualification of Bidders to the Contractor, Bonding Company, and Public Officials

By E. T. Nettleton
Engineer of Contracts, State Highway Department of Connecticut, Hartford

What is pre-qualification of Contractors?

Pre-qualification of contractors is the determination of the responsibility of each contractor to satisfactorily undertake and complete a certain construction project before he is issued plans, specifications and bid proposal sheet to bid upon the particular construction project.

Is the principle of pre-qualification new?

This principle is not new. It has been used to advantage for many years in private work when the owner receives bids only from a restricted and especially invited list of contractors. Pre-qualification is but an extension of the principle applied to the professions of law, medicine, and engineering, wherein persons must possess a certain knowledge of theory and experience before being licensed to practice in their own name.

Would not the fact that a contractor can obtain a surety bond protect the interests of the State?

A surety performance bond is explicitly a contract between the surety and the owner in which the surety promises to make good a deficiency on the part of the contractor. This bond may protect the owner to the amount of the contract, but there is no protection as far as costly delays and inconvenience to the public is concerned.

If the bonding company suffers loss, the general premium rates go up and the public ultimately pays the bill. Bids under costs are not the bargains people think they are. Continuation of cheap prices, besides increasing bond premium rates, produces costly failures and litigation, eventually forcing the reliable bidder to other fields of endeavor, and makes it practically impossible to obtain quality workmanship on the job. The general public should realize that every man is entitled to a square deal which involves an honest return for his accomplishment.

Are the surety companies careful as to whom they bond?

A past record of failures of contractors would appear to give a negative answer. In many quarters it is generally conceded that the ability to receive a bond is no guarantee of the responsibility of a contractor.

There are several causes why irresponsible contractors might be bonded, among which the facts that bonding companies may lack sufficient information as to the ability of the contractor and technical knowledge of the work to be done. Perhaps another cause is the eagerness of the agents of the bonding companies in attempting to beat out their competitors.

Why is pre-qualification preferable to post-qualification?

Pre-qualification saves the unqualified bidder or contractor the time and money spent in making a bid and the embarrassment of a rejection if his bid should be the lowest.

Pre-qualification is an aid to the awarding official, as the question of responsibility may be decided in a more unbiased manner when there is ample time for consideration and investigation of Contractors' claims and at a time when the decision is not complicated by knowledge of who the low bidder happens to be, with the consequence of pressure from various sources. Thus, the public official who awards the contract is relieved of considerable embarrassment and can award the contract to the low bidder who has already been judged as qualified, providing, of course, that his bid is reasonable and free from unbalanced items and other irregularities.

Why has pre-qualification not been more widely adopted by public officials?

As Mark Twain has said, "Everybody talks about the weather, but nobody does anything about it." So it is with pre-qualification. Public officials have been inclined to put off the decision as to responsibility of bidders until after bids have been received for two reasons: First, with the hope that any questionable bidder will not be the low bidder and, second, with the more or less false opinion that the responsible bidders may lower their bid against irresponsible competition. Back of the first reason may be the fear of political repercussions, the slurs of favoritism, possible laziness or their inability to distinguish the responsible from the irresponsible. However, this delay of decision backfires in a more explosive way when an irresponsible contractor happens to be the low bidder. As to the second reason, it is a known fact, by the writer, that many responsible contractors have either refused to bid or else have not sought bid proposals when irresponsible competition has been permitted.

What are the chief objections to pre-qualifications?

First, it is argued that pre-qualification shuts out the beginner. In answer to this it might be said that most construction men begin in a humble capacity; they often work with some existing responsible organization and thereby acquire the necessary training and experience for independent work. Under pre-qualification such men would be welcomed in the lower classifications and their advance would depend upon themselves. To have their fitness passed upon by an impartial body protects not only the public, but also the over-ambitious beginner, by preventing him from the assumption of burdens which might crush him.

Second, it is argued that pre-qualification would reduce competition. No doubt it would at first reduce undesirable competition, but to any field engineer who has tried to obtain quality

(*Continued on page* 79)

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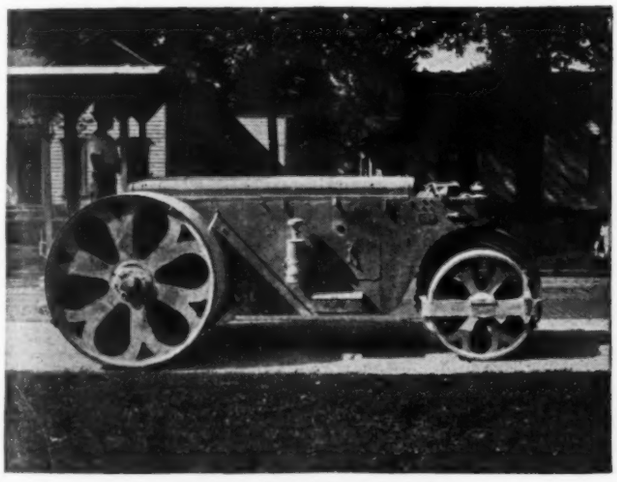

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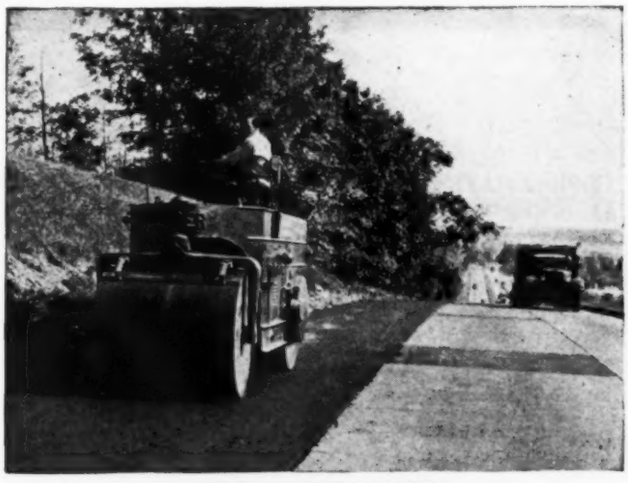
Automotive type, built in sizes from 5 to 12 tons.



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★ Cedar Rapids tandem plant produced the rock (plant stopped at time of photo, to change aggregate size). Caterpillar diesel direct V-belt power for the "works"; individual electric drive for belt units

Contractors at Work

Travel Plant Road Job, Morrison-Knudsen Co., Inc., U. S. 30, Idaho

JOB LOCATION: A 10½-mi. stretch of the Old Oregon Trail (U. S. 30 to you) between Caldwell and New Plymouth, Ida.

Consisted of: Ripping up and widening the old roadbed; installing drainage structures; placing two 3-in. layers of crushed rock and a 2½-in. layer of road-mix.

Processing Notes: The two base layers, graded into place and properly compacted, were composed of 2-in. and ¾-in.-minus crushed material, placed in that respective order. At time these photos were taken the ¾-in. stone was being windrowed down the centerline, in preparation for commencing work with the big Woods asphalt mixer.

★ Spreading windrowed 2-in.-minus stone for the bottom base layer. Four graders handled this job

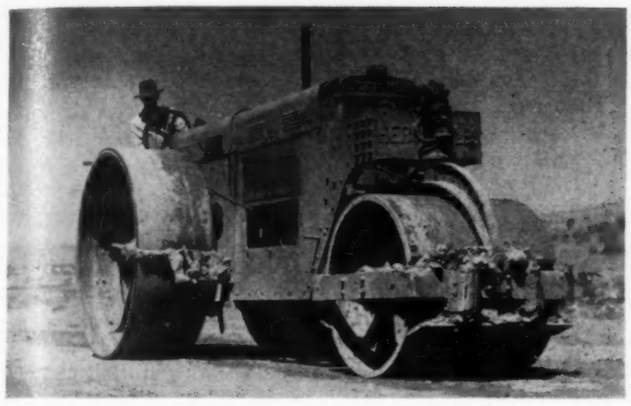
Equipment and Organization: A 60-man crew working two 8-hour shifts, 6 days per week, carried the job through the preliminary stage, including processing, hauling and placing of aggregate. About half that crew, working single shifts, completed paving in approximately two weeks, getting the job done about October first, in plenty of time for winter.

In addition to the Woods mixer (not shown) Morrison-Knudson Co., Inc., employed thirteen K-11 dump trucks, four Ford dump trucks, three 2,000-gal. water tank trucks, four motor graders, two Hercules 10-ton rollers, and two D8 Caterpillar bulldozers. A Lincoln greasing outfit and other mobile servicing equipment completed the field outfit, while crushing and screening was done with a Cedar Rapids tandem crusher.

Quantities: Specifications called for 31,000 tons of 2-in. and 55,000 tons of

★ General foreman Robert Barnes and superintendent Chet Whittekiend

★ Two water wagons, two graders—a hot-weather team on base construction



★ (Left): Rolling the first base lift. (Right): The stuff was windrowed thusly along the centerline for the base and worked by paired graders

¾-in.-minus material. About 6,000 bbl. of asphalt materials required for prime, road-mix and seal.

Who's Who: Chet Whittekiend was in charge of M-K, and Glen Thompson was resident engineer for the Idaho department of public works.

●

Cantilevered Steel Forms for Dam

Blaw-Knox Co., Pittsburgh, Pa., has received a contract for all the steel forms to be used in construction of the Bull Shoals Dam, Army Engineers' project on the White River in Arkansas.

To cost an estimated $47,000,000, the dam will impound waters for flood control and feed an electric power plant. About 2,500,000 cu. yd of concrete will be used, with pouring to begin in September, 1948. The dam will be 2,256 ft. long and have a height of 280 ft. from bedrock to the roadway that will traverse it.

The steel forms are of an unusual type, a new cantilever design developed by Blaw-Knox during the past two years. This type form is not supported by tie rods but is anchored in the block of concrete previously poured. It is stated to eliminate 60 to 75% of the anchors normally used. Nearly 2,000,000 sq. ft. of dam surface will be serviced by the cantilever pouring forms.

The dam is to be built by Ozark Dam Constructors, an organization made up of nine contractors in a joint effort. These contractors are: Morrison-Knudsen Co., Inc., Boise, Idaho; Brown & Root, Inc., Houston, Texas; Wunderlich Contracting Co., Inc., Jefferson City, Mo.; Peter Kiewit Sons Co., Omaha, Nebraska; J. C. Maguire & Co., Los Angeles, Calif.; Winston Brothers Co., Minneapolis, Minn.; David G. Gordon; Condon Cunningham Co., Omaha, Neb.; Chas. H. Tomkins Co., Washington, D. C.

●

Bridge Reconstruction in Europe—During the war 7,000 bridges in France were destroyed. Italy had an even larger total and Belgium 1,120. Today France has built 4,695 temporary bridges and 1,965 permanent bridges. Italy has rebuilt 6,000 bridges and brought to a passable condition 60% of its 25,000 miles of wrecked highways. Belgium has already erected 700 temporary and 232 permanent bridges.

Minnesota, Connecticut First in Safety Awards

Minnesota has won more awards in the National Traffic Safety Contest than any other state, the National Safety Council reports. Awards include one national grand award, 8 first place awards in the Midwestern region, and 2 honorable mentions, a total of 11. New Jersey is second with 10 awards. Connecticut with 3 has won the most grand awards but Minnesota with 8 has won more regional first place awards than any other state.

Less Diagonal Parking

Diagonal parking of vehicles along state routes within the boundaries of incorporated villages of New York State is on the way out, notes a public works department bulletin. During the past few months a change to parallel parking only was effected in 67 New York communities, increasing to 293 the number of incorporated villages which prohibit diagonal parking on their respective sections of state highways.

Highway Research Board

Heard, seen and noted at the Board's 27th Annual Meeting, which was marked by presentation of some 136 papers and committee reports and by a record postwar attendance of over 800

IF you were to ask us which were the most valuable and interesting among the several score papers packed into the Highway Research Board's three-day annual meeting (Dec. 2-5 in Washington), we'd counter by asking, "What subject is your specialty?" For if we can make any single overall comment, it is to the effect that the Board's program is thoroughly diversified and balanced among all the many fields of "unknowns" in highway engineering.

As in other meetings of recent years, there is a new attention to planning, administration and functional or traffic problems, while research in materials tends to become more specialized.

Only a few of the many papers can be touched upon here, due to space limitations. Here are notes on various subjects taken somewhat at random.

The only general session of the convention was marked by papers on polarized lighting for motor vehicle headlights, use of topographic maps, highway tax problems, and on long range planning—an odd collection of subjects for sure. The sparks flew among the three speakers on polaroid lights, a development still the subject of disagreement among manufacturing interests on the value and justifiable cost. No subject related to highway safety is more important, yet the public is said to be faced with a long period of waiting and transition to this form of lighting, which is brighter to the unprotected eye and requires major changes in auto electrical design.

The subject of long-range planning, which is now seen to be perhaps the most important single function of the highway engineer, was outlined by G. Donald Kennedy, Automotive Safety Foundation, whose paper will be presented in some detail in a forthcoming issue of ROADS AND STREETS. Meantime, we'll merely note Mr. Kennedy's reminder that the establishment of a program, rationally developed, is the ultimate objective of the planning surveys carried on for the past decade or more; and that a highway planning survey is not merely a "report" but a full-length view of the road situation. Data from these surveys continue to be the best and cheapest source of information needed for planning.

Pavement Studies

Pavement Pumping—H. W. Russell, Illinois division of highways, reported results of pavement pumping investigations made by Illinois, the Portland Cement Association, and PRA. Pumping (forceful ejection of water-suspended subgrade soil from under cover to pavements) occurs only when free water is present, axle loads are heavy and frequent, and the subgrade soil is capable of going into suspension. This leads to faulting and breaking of pavements.

The texture of the subgrade soil determines the susceptibility to pumping, the fine-grained clays being the worst offenders. Among the factors that definitely lessen the severity and extent of pumping are thorough subgrade compaction, the use of a granular subbase, a minimum provision of expansion and contraction joints, prompt maintenance, subsealing, and above all, reduction of heavy axle loading. Continuous wire mesh lessens pumping at intermediate cracks. Load transfer devices do not reduce the extent, but do lessen the severity of pumping. Thickening and widening the pavement have no effect, but most pumping occurs in the outside lanes most frequented by heavy traffic.

The Highway Research Board award for the outstanding technical paper of the 1946 meeting a year ago was presented to Dr. Norman W. McLeod, consultant to the Department of Transport in Canada. His paper: "Airport Runway Evaluation in Canada."

A report on pavement pumping correlated with traffic was given by K. B. Woods, F. H. Green, and H. S. Sweet of Purdue University. The following highlights are noteworthy:

In Indiana, investigations show that since 1940 the rate of progressive disintegration caused by pumping is exceeding the rate of repair. The worst conditions are in fine-grained soil areas, but pumping is now occurring at joints in areas of sandy soil. *Less than 1% of the total traffic is causing this greatly accelerated destruction.* Where axle loads are kept below the Indiana legal limit of 18,000 lb. no pumping has occurred.

Cement-Slurry Mixtures. W. H. Goetz of Purdue University, who has been experimenting with the design of cement slurry mixtures, noted that to correct an existing pumping condition, the highway maintenance crew needs a material to fill the resulting voids under the roadway. The material must be superior to the soil replaced so as to resist future pumping action. It must be easily pumped through a small hole; be thin enough to fill all voids; should harden or set quickly after placing without appreciable volume loss; should be durable, and if possible impervious to water. Mr. Goetz has found a satisfactory material composed of a slurry of portland cement, the major ingredient, and calcium aluminate cement, the minor ingredient. Age and brand of portland cement, water-cement ratio, temperature of air and all ingredients, and proportion of calcium aluminate cement to portland cement all affect time of setting. The initial consistency and time-consistency relationship up to time thickening begins can be easily controlled by using sufficient water. Thickening and setting time is controlled by varying the calcium aluminate cement—Portland cement ratio. The compressive strength is 3,000 lb. per sq. in. at the end of seven days, and the material will resist freezing and thawing. At a con-

The Job

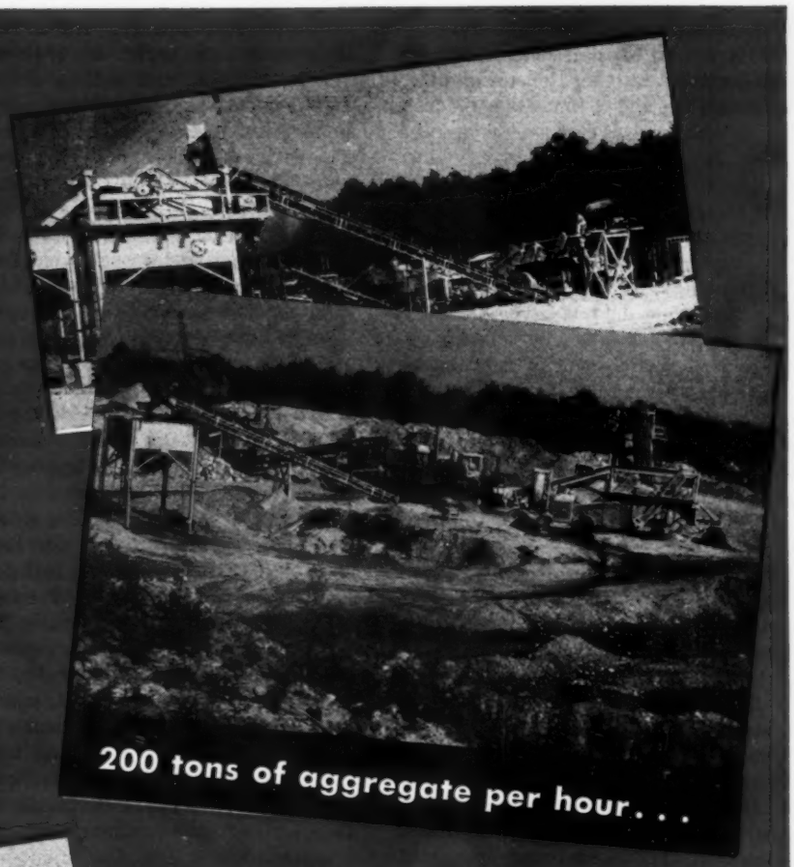
The Maine Turnpike

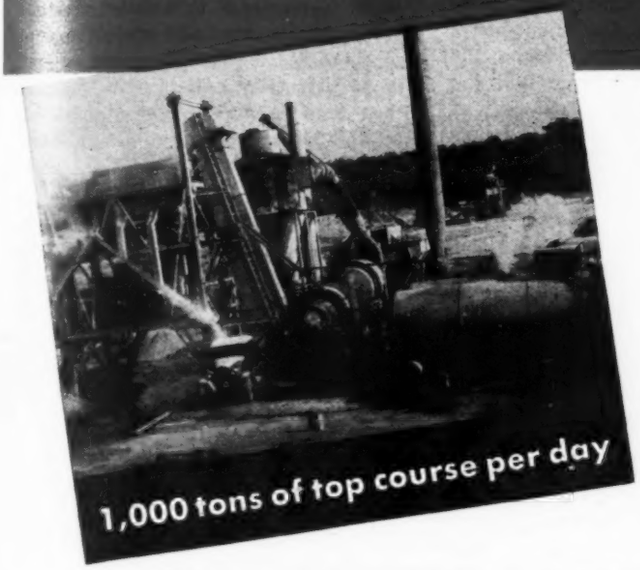
The Equipment

2 Cedarapids Unitized Plants
Cedarapids Model "E" Asphalt Plant

The Contractor

B. Perini & Sons, Inc.
Framingham, Mass.





PRODUCING the aggregate and mixing the top course of asphaltic concrete for the south half of the Maine Turnpike was the job assigned to two Cedarapids Unitized Plants and a Cedarapids 4,000 lb. Model "E" bituminous mixing plant. And right on schedule the job was done by the Perini organization.

On job after job, you'll find that contractors who know construction equipment best base their bids on Cedarapids production and get the awards. Whether you need 50 tons of aggregates per hour or 200—or more—there's a Cedarapids plant that will meet your requirements. When it comes to black top there's a Cedarapids bituminous mixing plant to meet the most exacting specifications.

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IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

stant cement ratio limestone dust up to 20% weight of total cement may be added without hurting the workability. Although the added limestone reduces the compressive stress, especially under 28 days, it reduces cracking caused by freezing and thawing. Asphalt emulsion, when added alone reduces the strength without materially increasing resistance to freezing and thawing, but when added together with limestone dust it gives the best resistance to freezing and thawing. A mixture of natural cement and calcium aluminate cement, though inferior in compressive strength and freeze-thaw resistance, has a satisfactory workability. With the possible exception of temperatures at or below freezing, calcium chloride does not improve workability.

Field Use of Slurry. F. H. Green of Purdue reported the results of field tests of the use of cement slurry mixtures in treating pumping pavements in Indiana. He has used such mixes to fill pavement cracks, joints, and voids under the road. A thinner mix (almost water-thin) was used for filling cracks than for slab-jacking. Where there was serious misalignment, pavement jacks were used. Although the earlier experimental work was done by a special group, all later work was accomplished by regular highway maintenance crews of six men. The portland cement and calcium aluminate slurries were mixed separately and then mixed together immediately before placing. The usual mix consisted of one 94-lb. bag portland cement, 18-lb. calcium aluminate cement, and about 65-lb. water. Water-thin when placed in the hopper, the mix required 15-20 min. to thicken. Water was then added as required for suitable consistency. The mix was first poured in a hole near the center of the pavement. As soon as it began to emerge from the edge or from another hole near the edge, the first hole was sealed with a wooden plug and the other hole was poured. The pavement jack was left in place 15 minutes. There was very little bleeding. Removal of several slabs showed that the slurry had completely filled all voids.

Although the equipment was rather expensive, the materials cost was less than half the labor cost. A new patch, though smoother, was found to be much more expensive. A 10-ft. long by 11-ft. wide slab cost $60 to replace but only $7.50 to jack up and support with a cement-slurry mix. Where the amount of pumping is limited, a new surface is not necessary, but it is best to treat the condition early before damage has been done.

Winter Maintenance. As a result of experiments begun in 1941 with calcium chloride and sodium chloride the New Hampshire highway department has developed a very satisfactory method of snow and ice removal as reported by LeRoy F. Johnson of New Hampshire.

C C grade sodium chloride is spread as soon as one inch of snow has fallen and been compacted or immediately after plowing is completed. The spread is about two feet wide along the pavement center, at about ¼ lb. per sq. yd. There should be enough traffic to prevent burial of the chloride by the snow. If a long storm dissolves the chloride, additional applications should be made.

With freezing rains sodium chloride is spread as soon as the ice forms, 300-400 lb. per mile usually being sufficient to dissolve the ice. When sleet and rain falling simultaneously form an ice sheet, the problem is more difficult. Calcium chloride at the rate of 200 lb. per mile is spread, and this is followed by an application of sodium chloride as described above.

New Hampshire has found chlorides far superior to abrasives in combatting ice and snow. Chlorides require less man-hours and equipment-hours per mile. Their experience during the past six winters has proved that the cost of abrasives exceeds the cost of obtaining bare pavements by means of sodium chloride, and when chlorides are used there is no expense of removing the material from shoulders, catch basins, and culverts. And the bare pavement is safe.

Pavement Salvage

Ohio Pavement Salvage. Following are highlights on Ohio's experience in salvaging old pavements by Ray Hanes of the Ohio department of highways. Ohio's highway system, built on the "pay as you go plan" has a large variety of types and widths of pavement, nearly two-thirds of which need improvement to meet present needs. Resurfacing should be performed on a straight economic basis allowing maintenance costs to govern the necessity for the more extensive salvaging operation. When an existing road surface becomes cracked, too narrow for traffic or otherwise inadequate, widening with non-rigid bases and resurfacing with bituminous concrete mixtures were found to be economical and satisfactory. The road can remain open to traffic; the new pavement is ready for use soon after compaction; the procedure is adaptable to any type of existing pavement; an extensive mileage may be covered during the construction season; and improved equipment and techniques have made labor cost reductions possible.

Traffic and Planning

Traffic Studies For Small Cities. Daniel O'Flaherty of the PRA in a paper "Simplified Methods for Travel Studies in Small Cities" states that much of the information required for the larger urban areas is not needed for the smaller cities of less than 50,000 population. Moreover, the time and cost required to make the complete surveys could seriously delay the collection of data needed in the many small cities throughout the country.

Important questions that need answers are: What are the city traffic problems? Will a bypass remove sufficient traffic from the downtown area to relieve the congestion there? Does a parking problem exist? PRA has been searching for ways to obtain this information; external (city-rim) origin-destination traffic surveys have been made for years. The parking survey is a newer development that is now becoming standardized. A combination of external and parking studies gives data on most important traffic movements in smaller cities.

PRA encourages the states to compile information for the urban reports in an attractive and colorful manner, thus helping highway administrators as well as the general public to understand the problems.

Rural Planning. C. J. Crawford, state manager, Dakota planning survey, speaking on "Highway Planning in a Rural State", urged all highway designers to make use of the data being gathered and kept current by the planning surveys. These data furnish an almost inexhaustible reservoir of information necessary for a sound solution of basic highway problems, as noted. However, the information should be used while still fresh. Otherwise it represents wasted effort. The planning surveys now operate as fact-finding bodies, but their experience, varied personnel, and necessary knowledge of legal requirements place them in a position where they can be of special aid to the rural states.

Reporting Highway Traffic Data. In his paper on the reporting of highway traffic data, D. K. Shepard, Texas highway planning survey, said that in Texas traffic survey during 1947 included volume counts on 198,831 miles of rural roads, state and county. Control counts were made at 208 stations of a week's duration and at 230 24-hour stations, both types repeated seasonally. Repeat counts supplement control data furnished by 89 permanently installed automatic re-

corders. Traffic volumes are reported on three sets of maps (state, district, county).

The author belives that more attention should be paid to the loads and classification of traffic. Texas is reviving its 1937 Loadometer study and is now operating 60 stations monthly.

While traffic volume is the major consideration in road planning, it is not the sole criterion. An equable area distribution, economy of construction, and cultural and economical development must all be given due consideration.

Traffic Performance on Acceleration and Deceleration Lanes. R. L. Fisher, N. J. highway department, reported observations made during a 3-day study in October, 1947 of operating conditions at the acceleration and deceleration lanes on the Pennsylvania Turnpike. The typical deceleration lane, for drivers making a right turn off the pike, is an extra lane 1200 ft. long beginning at full width. This gives a vehicle ample time to slow down from cruising speed to the design speed of the turnout. On these lanes, most vehicles crossed over into the deceleration lane near the beginning in a reverse curve path. Some 92% of the vehicles slowed down by engine compression alone.

The typical acceleration lane, provided for drivers entering the pike, is a long, straight, tapered lane that merges with the pike at a flat angle. On these lanes all vehicles kept their right wheels from 2½ to 3 ft. from the right edge of the pavement and used the lanes as designed.

Means of Evaluating Intersection Improvement. Leon Corder, senior maintenance engineer, Missouri state highway department, while giving full credit to intersection "stop and go" techniques of city traffic engineers, pointed out that rural intersection problems are often quite different from those at urban intersections. He defined a rural intersection roughly as one which has about 750 vehicles per average hour, entering from all approaches. The author gave a table of proposed intersection controls ranging from 30-in. stop signs on minor route and no controls on major route to regular traffic signal installations. Along with this he furnishes a graph which shows the type of intersection control determined by total traffic and per cent traffic in the minor artery.

Standardized Road Section Designations. C. H. Makeever, chief engineer of the Ohio highway planning survey on the above subject, noted that until this year Ohio has been struggling with a "Topsy-Grown" method of identifying her roads. Double numbers and general confusion resulted. A numbering plan was worked out in which the system can be easily understood and used; all points on the state system are identifiable with no ambiguity; the system can be easily perpetuated; data are in form to be recorded on punch cards; and old sections where identifiable can be tied to the new system.

The plan is to base all section designations on route numbers and counties. All the new sectioning for a route begins at the west or south boundary of any county traversed by that route. The first figures appearing in any designation are the number of the route on which the section is located. The first three letters of the county form the prefix. Thus a point 12.41 miles east of the Franklin County line on U. S. 40 would be FRA—40—12.41. Such a system aids in recording data on contracts, maintenance, costs, right-of-way, and police accident records. Road characteristics cards will contain ratings determined by condition of the section as to width, surface, etc. These will help planning department determine which work is most urgent.

Numerical Ratings for Highway Sections. Karl Moscowitz, PRA, Phoenix, on this subject described a project priority rating method developed in Arizona, which takes in structural, safety and service adequacy. The elements comprising the basic qualities were analyzed and weights assigned to each. The method has been applied to 3800 miles state and 1000 miles of the forest highway and found to be a valuable aid in preparing and backing up construction programs.

Stage Construction of "Limited" Expressways. Fred J. Hughes, programming and planning engineer, PRA, defined "stage construction" as the construction of an expressway to something less than the ultimate planned improvement but to a stage where the facility or a portion of it may be open to traffic. While recognizing that stage construction may be necessary, this speaker stressed the thought that stage construction should be a last resort rather than the first "out" when funds are scarce. In all cases the plan to be followed should be based on comprehensive and comparative studies which will insure it is the best that can be devised; that it will better, not worsen, traffic conditions; and that no unworkable situations or traffic bottle-necks will be created by the temporarily curtailed construction program.

Turf Problems

Experimental Stabilized Turf Shoulders: Oliver A. Deakin, parkway engineer for the New Jersey highway department, described the design of an experimental stabilized turf shoulder. This design furnishes adequate width for breakdowns and emergency stops; the turf can withstand the wear of occasional passenger vehicle traffic; the load bearing capacity in all seasons is sufficient; and it presents an attractive appearance throughout the year; it consists

"WELL I MANAGED TO ROUND UP A FEW MORE MEN FOR YOU."

of a 3-ft. bituminous concrete and 7 ft. of stabilized turf shoulder.

Harry H. Iurka, landscape architect, N. Y. state department of public works, described the growth of turf on earth shoulders of test sections on Long Island which were stabilized in 1945-47. Although the soil is sandy, the report indicates that turf can be grown and maintained under occasional traffic on mechanically stabilized soil shoulders which are stable under New York state legal loads when drainage is adequate and soil material is within range permitted by AASHO spec. M56-42 for Type-A material. The report stresses the importance of an effective program for turf maintenance.

Pavement Design

Load Deflection Tests with Dowels. E. A. Finney and W. O. Fremont of the Michigan highway department presented a test method for evaluating load transfer devices. The authors believe that a load deflection test procedure is the answer. The Michigan highway department has been investigating this subject since 1934.

No significant relationship is found to exist between length and relative deflection of the dowel-concrete system; dowel diameter is the most important factor in controlling deflection; dowels with diameters greater than 1 in. are required to control deflections under normal shear loads; slab thickness in relation to dowel diameter needs to be considered since the bars of larger diameter rupture the concrete before failing in flexure; the residual deflection of dowels diminishes with increase in dowel diameter, being at a minimum for any diameter dowels of 20 in. in length; to compare with relative efficiency of load transfer units the authors suggest a "joint Modulus" which is proportional to the shear force and inversely proportional to the deflection.

Concrete Temperature Stresses. Evan P. Bone, corps of engineers, Ohio river division, defines inherent temperature stresses as those which cannot be alleviated by exterior volume changes of the concrete. In other words, they are not relieved by expansion or contraction joints. Pavements 6 to 24 in. thick were tested at varying depths. In slabs of 8 in. or less the temperature gradient is a "straight line" from top to bottom. In the thicker slabs the gradient is curved, there being a larger temperature change from top to bottom. If there is any question about position, temperature steel should be placed near the top where the greatest temperature changes occur. Daily rather than seasonal variations cause the worst stresses.

More information is needed about the spacing of joints in thin pavements, thinks Mr. Bone. Many authorities believe spacing could be greater than is common.

Pavement Evaluation by Loading Tests. L. A. Palmer and James B. Thompson of the Navy Department reported on tests and evaluation covering flexible and concrete pavements at 50 naval and marine air stations. Among conclusions: (1) It is wise to carry the laboratory to the field—simulate actual conditions. (2) There is no doubt that under the pavements the subgrade moisture content is less, the in-place subgrade density is greater for most soil types, than has been assumed, especially in the case of flexible type pavements. (3) Except where confined to relatively narrow lanes, plane traffic tends to increase slowly the load bearing capacity of asphalt surfaced runways. (4) The subgrade moisture content affects to some extent the subgrade bearing, but affects the flexible pavement bearing only slightly. (5) Triaxial shear data obtained with undisturbed subgrade samples provide a reasonably good index to the bearing value of the subgrade.

Salary Practices

Salary and Wage Practices of State Highway Departments. S. C. Hadden, consulting engineer, prepared a formal paper on salary and wage practices of state highway departments. His talk, however, was a strictly informal and colorful one on a paradoxical situation of the departments, which cannot compete with private business for administrative and professional personnel, yet require the best talent for effective administration. Amount of pay is not the only problem, noted Mr. Hadden. Many departments need a well-balanced and consistent plan to provide equal pay for work of equal difficulty. Few states have taken any recent positive steps to modernize their recruiting and other personnel practices to attract the best talent among veterans and displaced war workers. Advancement on the basis of the merit concept rather than the tenure concept should be encouraged.

The organization of departments should not just grow but should be changed to suit the increasing volume and character of highway work.

An effective approach for reorganization is through the development of an ultimate comprehensive plan for the entire department, to serve as a check on the adequacy of the existing plan, as a guide in making immediate improvements which can be effected without disarranging present operations.

•

Airport Program Makes Progress

Federal-aid Airports' 18-month-old program is off to a fair start and compares favorably with other Federal programs involving grants-in-aid, according to W. R. Macatee, manager, ARBA's Airport Division. He explained that considerable time is required to develop necessary plans and initiate Federal-aid programs.

Of the present Congressional authorization of $500,000,000 in Federal funds to assist in a nation-wide 7-year airport development program, $77,500,000 has already been appropriated by Congress. The program calls for 3,050 new airports and improvement of 1,625 existing airfields. CAA had received 117 applications for airport development up to Nov. 5. At that time, 104 grant offers had been made to sponsors of projects, involving $11,674,836 in Federal funds, or about 17% of Federal funds thus far appropriated under the act.

CAA officials predict that 40% of funds available will be under grant offers by the end of 1947; and the remaining 60% obligated before mid-1948, prior to the time when Congress is expected to make additional funds available.

•

PCA Appoints New Manager Mfg. Research

Dr. A. Allan Bates, vice pres. for research and development of the Portland Cement Association, has announced the appointment of Carl F. Clausen as manager of the Manufacturing Research Section, and secretary of Subcommittee C of the General Technical Committee. His headquarters will be at the Association's general office in Chicago.

Before coming to the Association Mr. Clausen was assistant to the president of Pacific Portland Cement Company, San Francisco, and was associated with F. L. Smidth & Company, in designing and operating equipment and plants for cement and related industries.

During the war Mr. Clausen was appointed Technical Consultant on cement industry to the War Production Board in Washington, D. C., and held other war positions.

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Traffic Actuated Signal System

How New Jersey "Robot Traffic Cop" Operates

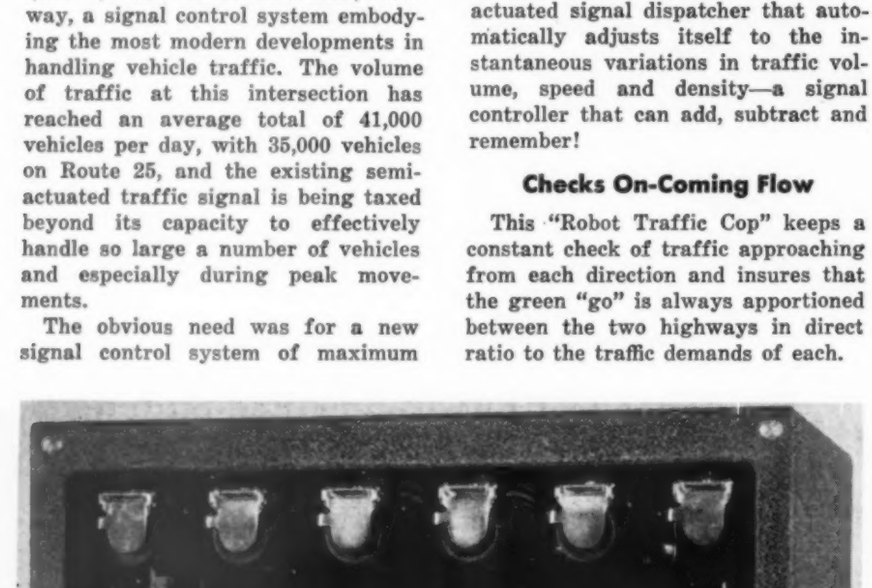
By James L. Hays
Engineer in Charge, Electrical Division,
New Jersey State Highway Department,
Trenton

THE New Jersey State Highway Department will shortly place in operation at the junction of Route 25 (US 1) and Lawrence Street, Rahway, a signal control system embodying the most modern developments in handling vehicle traffic. The volume of traffic at this intersection has reached an average total of 41,000 vehicles per day, with 35,000 vehicles on Route 25, and the existing semi-actuated traffic signal is being taxed beyond its capacity to effectively handle so large a number of vehicles and especially during peak movements.

The obvious need was for a new signal control system of maximum efficiency, embodying a number of desirable new features and without the limitations imposed by the existing signal equipment. This led, after detailed study in collaboration with Mr. Arnold H. Vey, Traffic Engineer, New Jersey Motor Vehicle Department, to the selection of a fully traffic actuated signal dispatcher that automatically adjusts itself to the instantaneous variations in traffic volume, speed and density—a signal controller that can add, subtract and remember!

Checks On-Coming Flow

This "Robot Traffic Cop" keeps a constant check of traffic approaching from each direction and insures that the green "go" is always apportioned between the two highways in direct ratio to the traffic demands of each.



★ Fig. 1—Part of the brains of the "Robot Cop"

In order to adapt the new dispatcher to the existing system, it is only necessary to replace the present controller and to install pressure-type detector in place of the magnetic type now in operation on Lawrence Street and to add the new type detectors on Route 25, located, in each instance, some 250 ft. back from the stop lines. These detectors, which appear to the motorists as rubber plates or pads set into the road surface, are operated by the pressure of passing vehicles, thus sending to the dispatcher a constant record of the volume and spacing of traffic as it converges on the intersection from the four directions.

The new dispatcher is an electronic device capable of receiving and weighing the traffic information sent in to it by the detectors and regulating the signals in such a way as to pass through the intersection the greatest possible number of cars with a minimum of delay.

"Variable Interval" Element

One of the basic elements of the system which contributes to its high efficiency is the operation of what is known as a "variable vehicle interval." It is the length of this interval, balanced against the volume and density of traffic, which determines the proper time to shift right of way. For example, with traffic moving through on a green light on Route 25 and with a red light on Lawrence Street, each approaching vehicle on both streets will be "weighed in" to the system. The cumulative effect of the oncoming Lawrence Street cars will be to cause a steady shortening of the vehicle interval governing Route 25, thereby requiring that traffic on the latter route maintain a sufficiently close spacing to warrant retention of the green light thereon. When the green signal shifts to Lawrence Street a reverse set of conditions will obtain, and the length of time that right of way is retained upon that street will depend upon a balancing of the vehicle flow on Lawrence Street against the accumulating demand of Route 25.

The process may be likened to the necessity of one street "earning" the right to retain the green light against the demand of the other street. With

traffic arriving in appreciable volume against a red light there is an ever increasing effect exerted to bring over the green light to that street. Therefore, the street having the green light must maintain a flow sufficient to record detector demand at intervals not greater than the vehicle interval in effect thereon, or else the right of way is shifted to the other street.

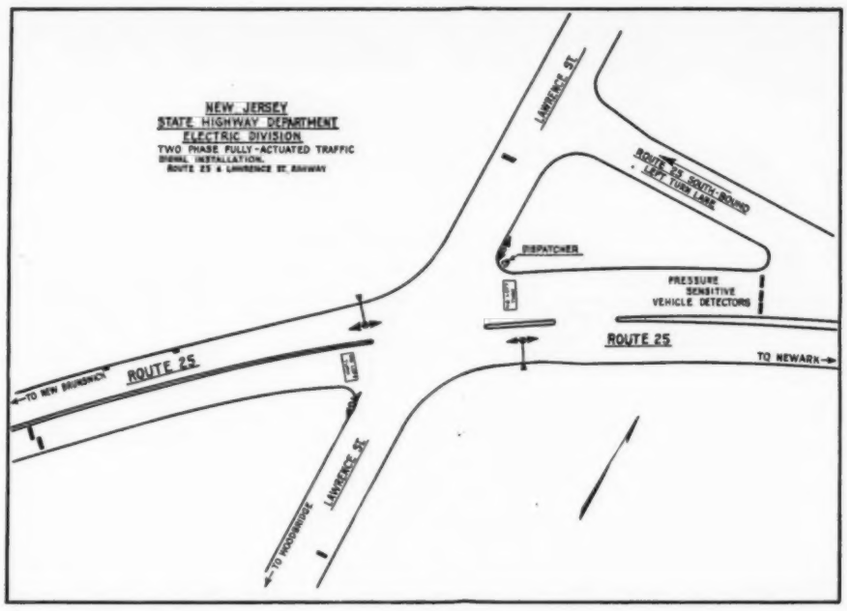
"Maximum Interval" Action

Under these conditions there can be no straggling and the intersection is at all times used to its greatest capacity. In the event of extremely dense traffic there is brought into operation a maximum interval which will arbitrarily terminate the green signal for the traffic stream. However, so sensitive is the mechanism and so watchful of opportunity to shift the light, that right of way is rarely maintained to the absolute limit on either street.

Another feature of the system is its ability to "remember" the number of cars which have asked for the green light, and when the signal is shifted in their favor to allow a proportionate starting time before it begins to apply the rigid requirements of its watchdog vehicle interval.

When traffic is light, the requirements for retention of the green light are much less severe than under conditions of heavy volume, and vehicle movement is at natural speed and spacing. It is characteristic of the system that the length of the signal cycle and its division between the two streets is constantly changing and accommodating itself to the demands of the moment.

It is expected that the operation of this type of automatic control will go far to eliminate the congestion and delay which frequently occur at Route 25 and Lawrence Street and at other critical intersections where similar installations are to be made.



★ Fig. 2—Layout of the two-phase, fully actuated signal system herein described

Why Pre-Qualification?

(*Continued from page* 68)

construction from an irresponsible bidder, this fact certainly would be no drawback. Eventually more responsible bidders would be encouraged to bid if misfits were eliminated.

Third, it is argued that pre-qualification would increase political or personal favoritism. This assumption is not justified, as at present the awarding official can reject an irresponsible bidder with or without questionnaires, he alone deciding the question after the bids are opened.

Fourth, it is argued that pre-qualification is an invasion of private affairs and consumes a lot of time and labor on the part of the contractor. Such an objection as to the confidential questionnaire is never raised by a contractor to either his banker or the Internal Revenue Department, nor should it be objectionable to file with a public official responsible for the expenditure of the people's money. Any questionnaire used should not be so complicated that it would be a hardship to fill out once a year, with perhaps a few supplementary statements in between, when it might appear that certain conditions have changed.

Who is a responsible bidder?

It is generally agreed that a responsible bidder, whether an individual, firm, or corporation, may be defined as one who is able to prove that he is possessed of satisfactory skill and knowledge, good integrity, sufficient plant, equipment, personnel, labor, and finances, at the time, to undertake and satisfactorily perform the construction work upon which he wishes to bid, should he be awarded the contract. In addition he must be in a position to obtain the materials required for the job.

How might responsibility be determined?

By the insistence of annual filing of a contractor's statement, plus the obtaining of supplementary information within that period, public officials and engineers can easily determine the responsibility and qualifications of a contractor for the work contemplated.

Gas Tax Division Now Barred by 20 States

When Ohio adopted an anti-diversion amendment to the state's Constitution at November's election, it became the 20th state to forbid use of highway-user tax receipts for purposes other than highway spending. The diversion, which such amendments forbid, has cost the nation's road systems some 2½ billion dollars since 1925. Even last year more than $100 million was diverted in the states without amendments, Federal figures show.

In some states where diversion has been heavy in the past, but where it has now been abandoned either voluntarily or by constitutional amendment, requests are arising that funds previously diverted be returned now for badly needed highways. In one of those states, Illinois, the rural letter carriers, an important highway user group, have asked that action.

At least two more states—Massachusetts and Tennessee — vote next year on full prohibition of diversion.

On a national basis, diversion last year took 6 cts. of every highway tax dollar collected, according to figures of the Public Roads Administration.

●

Preparing County Drainage Maps—The State Highway Commission of Indiana is preparing drainage maps for each of the 92 counties of the state. The commission is utilizing the services of the Joint Highway Research Project in this work. Drainage maps have been completed for 26 counties.

Safety Hints for Construction Crane Operation

We are indebted to Liberty Mutual Insurance Company for a valuable little folder which presents the following tips and drawings on job safety

TOP performance in crane operation requires continuous, high speed output on every job. Safety is a requirement of efficient operation.

To obtain continuous, accident-free operation, a knowledge of crane accident locations is important to the foreman, the operator and the workers. Herein is offered operating information developed from past field experience to acquaint foremen and operators with these problems.

An analysis of more than a thousand crane accidents causing lost time injuries provides these figures:

A—17% Working or standing under suspended load
B—17% Loss of load due to poor rigging, hooks, or slings
C—11% Fueling, checking water, oiling or adjusting moving crane parts while equipment is in motion
D— 9% Operating without authority or signals
E— 7% Failure of defective boom, cable or sheaves
F— 6% Working or standing in line of crane body or boom
G— 5% Pushing load by hand, including electric shock
H— 2% Hooking, coupling, hitching, etc., with hands in pinch point
J— 2% Failure due to overloading
K— 2% Ascending and descending cab without using ladder
L— 1% Operating too near stationary equipment.

Electric Shock—Power Lines

Crane operations close to power lines deserve particular attention. The electrocution hazard caused by the crane boom or fall cables touching power lines is one of the most serious in the construction industry. A closed electric circuit and a difference in voltage are required for the passage of current. A worker can become part of such a circuit by contact with a ground and a live wire or electrically charged part.

As the fall line cable or boom accidentally touches the power line, the crane, boom, cable and attached bucket become electrically charged. Thus the CRANE OPERATOR has a heavy responsibility to prevent the boom or fall line cable from touching power lines. This responsibility becomes all the more important when it is realized that the crane operator is in a relatively safe position while in the cab, due to the low difference in voltage across his body. A worker on the ground touching any part of the crane when it is charged becomes part of a closed electric circuit with a high voltage drop and is electrocuted. If the operator should step off the crane when it is charged and have one foot on the ground and the other on the crane, he too would be electrocuted.

Where work requires crane operations close to power lines, foremen and crane operators should check with the "Boss" on:

1. Re-location of the power lines or
2. De-energizing of the lines or
3. Erection of mechanical barriers over the crane boom, cables and wires to prevent physical contact with the power lines.

NOTICE
THIS HIGHWAY HAS BEEN DESIGNATED A
FREEWAY
AS PROVIDED BY THE FREEWAY ACT OF 1943. DIRECT ACCESS WILL NOT BE GRANTED. INVESTIGATE REQUIREMENTS OF THIS ACT BEFORE IMPROVING ABUTTING PROPERTY. INQUIRE OF ILLINOIS DIVISION OF HIGHWAYS

•

Steel Production in 1947—Steel production in the United States in 1947 was more than 84,000,000 tons, a tonnage greater than ever made before in a peacetime year.

How Freeway Notices Are Posted in Illinois

More and more states are recognizing the need for modern freeway laws.

Illinois has such a law, resulting in signs like that pictured here. The Freeway Act of 1943, under the authority of which the sign is used, briefly defines a freeway as a highway designed primarily for through traffic and to which owners of abutting property have no right of access by reason of such ownership. It authorizes the State Department of Public Works and Buildings or the authorities of any county or city to designate existing highways or new highways as freeways and to control access thereto. It also authorizes the designating agency to acquire rights of access inherent to abutting property by purchase or condemnation.

Section 3 of the Act provides for the freezing of all existing means of access whenever an existing highway has been declared a freeway. The purpose of this provision is to prevent further development of the abutting property during the period in which the state, county, or city is making plans and acquiring right-of-way for the physical conversion of the highway to a freeway. It is this section of the Act which requires the posting of signs such as that pictured in the photograph.

Cut TRACTOR COSTS one/half

with an

Ottawa Hydraulic Front End Loader

Tractors used ½ the year cost twice as much to own as tractors used all year 'round.

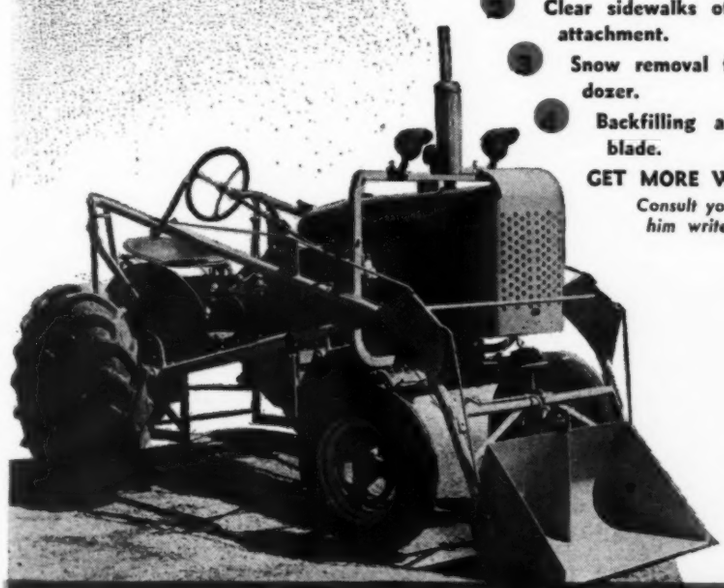
There is an Ottawa loader designed for use with light industrial tractors such as the International A and Case V A I illustrated here. These loaders have been approved by Industrial Engineers of leading tractor manufacturers.

These Ottawa Loaders and their attachments have enabled State highway departments and other light industrial tractor owners to cut light tractor operation costs over ½. Keep your tractors working all year 'round. Here are some of the jobs the Ottawa Hydraulic Front End Loader will make it possible for your light tractors to do when they would normally be idle.

- **Load trucks with cinders, sand or salt for treatment of icy streets or highways.**
- **Clear sidewalks of snow using right or left angle snow blade attachment.**
- **Snow removal from Business district streets by using light bull-dozer.**
- **Backfilling and leveling of roadway shoulders with light dozer blade.**

GET MORE WORK OUT OF THE TRACTORS YOU NOW OWN

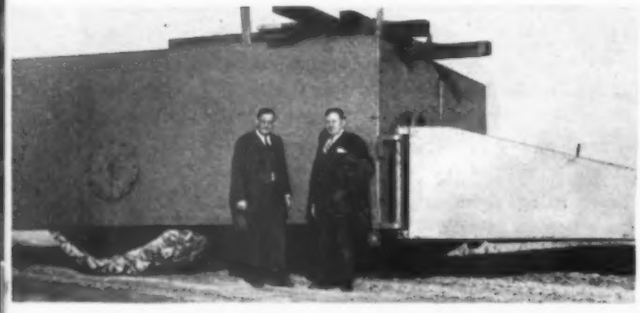
Consult your industrial tractor dealer, if he can't supply you have him write or write yourself for full information and price list.



"The Ottawa" REG. U.S. PAT. OFF.
INDUSTRIAL HYDRAULIC FRONT END LOADER
PAT. NO. 2,131,961 OTHER PATS. PEND.

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

★ Dinosaur tracks, 1948 style, as the super compactor does its business



★ At the left, Gen. Cecil R. Moore and consulting engineer O. J. Porter. These views give a fair idea of the compactor's construction. Note two articulated compartments, each with space fore and aft of the tires designed to hold weighting material

★ Showing details of testing jack, the purposes of which are to raise the box during tire change and make static load tests

(All photos on this page courtesy Robert M. Mottar, Baltimore)

200-ton Super Compactor

Being Tried Out at Baltimore Airport

- **400,000-lb. rubber-tired roller being used for top lifts of sandy materials**
- **C. J. Langenfelder & Son, Inc., paid separately for sheepsfoot rolling; all procedure details specified**
- **75-machine outfit moved 55 to 60 thousand yards daily**

By Harold J. McKeever
Editor, ROADS AND STREETS

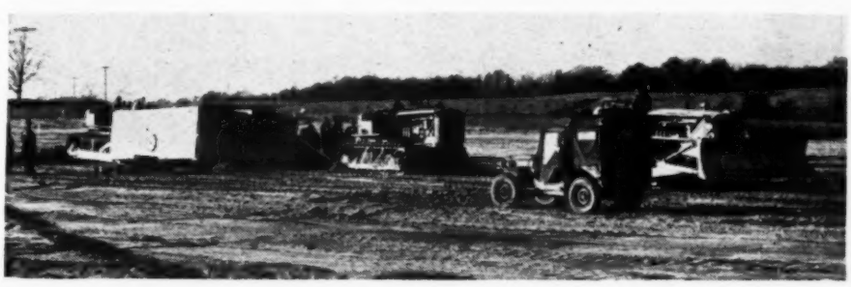
SAND is easy stuff for building heavy duty runway subgrades, and then again it isn't. For example, at Baltimore's new Friendship Church Airport, 6,100,000 cu. yd. of "mostly sand" was moved at a rate of 55,000 to 60,000 cu. yd. per two-shift day, with a relatively small fleet of machines for this yardage. Getting the 95% modified AASHO density specified under paved areas was no job at all for lifts two feet or more down under the rollers. But securing this compensation in the top lifts was difficult due to the tendency of the rollerfeet to tear up the surface rather than "walk out."

In order to properly densify the sandy material immediately under the pavement, and get deep compaction in cut sections, the Baltimore Department of Aviation staff is currently experimenting with the largest and heaviest compaction rig ever built.

Biggest Roller Yet

Weighing 200 tons fully loaded and 44 tons empty, this machine consists of two specially designed articulated steel frame "tubs," each carried on two 3300x33 pneumatic tires, two in each box, mounted on a single axle and turning on independent bearings. The two load boxes in which the tires are mounted are articulated to allow oscillation, thus giving uniform compactive effort and avoiding overloading of the tires when traveling across uneven or non-uniform ground. Weighting is done with 75-lb. iron ingots. Tires (Goodyear) are of standard mold but are built with a special 60-ply nylon carcass. Tires reputed to have cost approx. $5000 ea. and weigh about 1800 lb. each. Tire pressures of 130 to 150 psi. will be used. The machine was designed and built by O. J. Porter and Wm. Jervis of O. J. Porter & Co., consulting engineers. It capitalizes the experience of the Porter organization acquired in running super-compaction tests for the Army Engineers at Stockton, Calif. The City of Baltimore purchased the machine, and the contractor will operate it with a heavy towing tractor, receiving payment on a tractor-hour basis.

Going on with details of this unusual and notable piece of experimentation, its two-fold purpose—stated more explicitly—is to secure deep compaction (5 ft. or more) under the completed subgrade in cuts, and to compact the top lifts throughout all areas under and adjacent to pavement. It is well known that it is practically impossible to compact sand immediately under a sheepsfoot roller to the density that will later be produced under the wheels of very heavy planes. This device will be needed only for surface densification on fills, even though field checks indicate that densities of 95% to 103% modified AASHO at 18 to 24 in. under the surface have been obtained with sheepsfoot rollers weighing 525 psi. and having 7 in. high and 6½ sq. in. feet. Although the fill compaction already obtained is considered to be high, it is anticipated that additional consolidation resulting in 2 to 4 in. of settlement will be obtained under the mammoth compactor as even higher densities have been obtained under the traffic of heavy airplane tires.



★ Three tractors failed at first attempt to pull the 200-ton fully loaded compactor out of a soft spot

★ A-C, Caterpillar and International tractors teamed up to move sandy soil at a high steady rate with several makes of pans, but track assemblies lasted only 1500 to 2000 hours including one rebushing of rollers

How Big Roller's Jack Operates

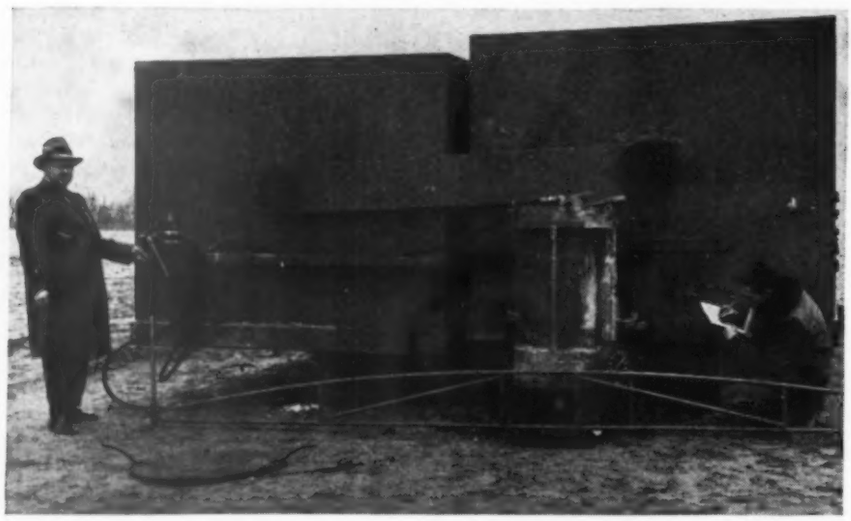
The hydraulic jack built on the back end of the super compactor has several uses. Its operation is described by O. J. Porter as follows:

(1) It can be used for raising the back end of the box when changing tires, or for jacking up the machine if stuck due to striking a weak spot in the subgrade. The jack exerts upward or downward pressure through a set of rollers, which travel along a flangeway extending across the back of either compartment.

(2) Its primary use is for making static load tests at any time desired. This can be done by stopping the roller and leveling the boxes by adjusting jack screws at the four corners of each box. This steadies the machine during test pressures. A 6x6 timber is placed under the two boxes at the bottom front edge, to take compression when lifting up on the two boxes with jack spanning the gap. Pivot bars take the tension resulting from boxes tending to rotate out.

The pressure weighing cell with test gauge is placed on a 24 or 30-in.-diam. plate which has been properly seated at the center rear of the unit. Cell includes a spherical contact surface which contacts a similar surface on lower end of piston to eliminate eccentricity.

The roller and jack are backed up and set on the plate unit, and a truss bridge set up with ends supported in stakes outside the zone of influence, to support dial gauges for measuring deformation of (plates) ground durring load test. The hydraulic jack is operated by a high-pressure oil pump and motor assembly mounted inside the left load box. With a 4-way valve it can exert a max. pressure of 200,000 lb. to the plate when roller is fully weighted and jack centered between the boxes. In this way tests can be made quickly to determine the Westergaard "k" value or subgrade bearing value by means of static load.



★ Showing 4-way valve from oil pump located inside box, bridge staked in ground, and jack set on plate and pressure weighing cell. Nathan Smith, Jr., taking readings

The contractor bid 1.8 cents per cu. yd. for this specified compaction in addition to 25 cents for "excavation," with provision of additional payment on a machine-hour basis for any extra rolling required to gain the specified density. No extra rolling whatever has been necessary for obtaining specified density up to a level three feet below the top of the last lift. This specification and method of payment attracted an unusually low bid, and are considered to have resulted in securing density with a minimum of roller time.

The material encountered has run about 75% sand, 15% sand-gravel and 10% pockets of white silty clay or silty clay in combination with sand. Pockets were seen to constitute a hazard when existing below the surface in cut sections. Cuts were taken down to 4 ft. below the subgrade under pavement areas wherever such material was encountered. Clayey material was largely removed to beyond pavement areas, or dispersed by the pans in the lower lifts of fill sections. The sand itself has proved quite variable, weighing from 100 to 135 lb. per cu. ft. compacted.

Moisture will be limited to around 8% under the super-compactor. Considerable moisture latitude has been permissible during sheepsfoot rolling.

Detects Weak Spots

The super compactor will serve an additional valuable function of helping detect lenses of weak material under cuts or poorly compacted spots in fills. When such spots are encountered, the machine will simply sink, as was demonstrated the day the accompanying photographs were taken. On this November day, while making the first experimental passes, the rig settled suddenly at a subgrade failure point over a storm drain, thus "smoking out" a weakness that might later

(*Continued on page* 86)

★ How front corners are blocked up after boxes are leveled

★ Details of pressure weighing cell and plate, seen at left

"Speed on the Job and to and from the Jobs"

"QUICK-WAYS" are unmatched for versatility. Whether you want a shovel, crane, dragline, pile-driver, clamshell, trench-hoe, scoop or backfiller, you have all eight in one **"QUICK-WAY"** on one chassis.

To that add these five features:

CONVERTIBILITY Any **"QUICK-WAY"** converts in *minutes* from one unit to any other.

PORTABILITY Your **"QUICK-WAY"** travels on or off the road at truck speed, spends more hours *working*.

FAST OPERATION Fast **"QUICK-WAY"** hoist and swing action moves more material per day.

INTERCHANGEABILITY Many **"QUICK-WAY"** parts are interchangeable . . . easier adjustment and repair.

ECONOMY Low initial investment, low maintenance cost.

These advantages all add up to greater profits on any job you give a **"QUICK-WAY"** There's a **"QUICK-WAY"** owner near you: ask HIM.

Model E: 4/10 cu. yd. cap. for mounting on any standard 5-ton truck.

Model J: 1/4 cu. yd. cap. for mounting on any standard 1½-ton truck.

Service available from our Distributors, strategically located throughout U. S. and worldwide.

For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

First to build power shovels for truck mounting; still the leader after 29 years

★ Allis-Chalmers HD-19, new 40,000-lb. giant, helped push-load scrapers and prepare loading paths on return

★ Self-powered scrapers were mostly snatch loaded, to save strain clutches

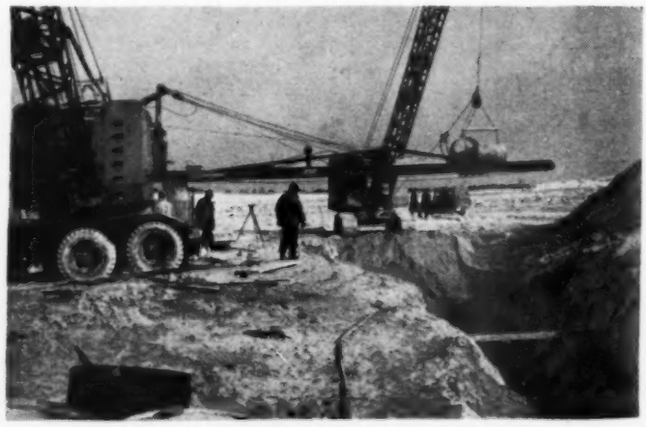
★ Two 2-yd. Lorains fed the Euclids on longest haul work. Each shovel moved as high as 4500 yd. daily in two shifts

New Baltimore Field to Meet "International Express" Standards

The airfield being built for Baltimore will conform approximately to standards set for the highest class or "International Express" airport in Civil Aeronautic Administration Technical Standard Order TSO-N6, issued Nov. 4, 1947. It will consist of one 10,000x200 ft. and two 8,000x150 ft. runways in a triangular layout, with taxiways 75 ft. wide. Runways will be graded 500 ft. wide and super-compacted 300 ft. wide using the machine described herein. The pavement design loading, originally set at 150,000 lb. per wheel, has been reduced to 100,000 for a single wheel or 125,000 for dual wheels in compliance with recently published CAA "International Express" standards.

have resulted in a plane accident. In normal use the unit will first be operated at half or three-quarters load for one pass to detect and correct any extremely weak areas before final rolling under full load. Runway graded areas, both cut and fill, will be rolled by the machine to a width of 300 ft., and taxiway areas 170 ft. But prior to performing routine coverage, the effects of the roller will be tested thoroughly on several 18x400 ft. experimental strips, using from 2 to 32 passes. It is expected that the findings will determine how best to proceed with routine work, and will serve as the basis for pavement specifications. The Airport Board plans to let paving late in February.

The selection of pavement type will also be settled only after determining the compactability of the sandy subgrade. If a flexible pavement is used, one design being tentatively considered will consist of a 4-in. granular leveling course placed after removing the top 4 in. of rolled grade; 6 in. base of selected aggregate, stored from excavation; 6 in. of water-bound macadam, placed and rolled in two layers; and a 3-in bituminous hot-mix surface, in two layers.

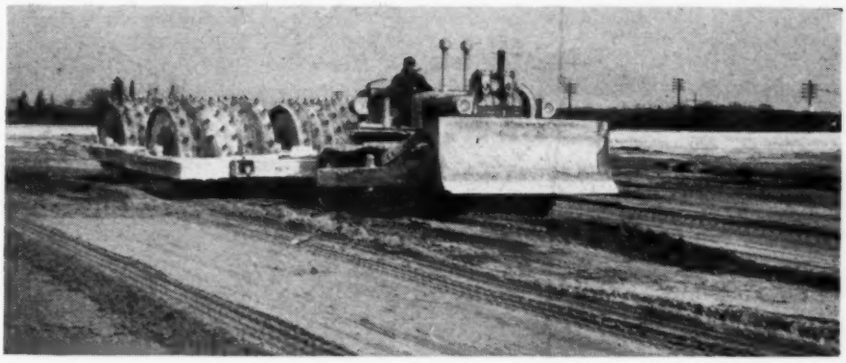


★ Soil-sand mixture was hand tamped around storm drain pipe, to insure proper bedding through the sandy soil. Storm drain pipe set by a truck crane, cradled in damp mixed soil-sand dropped directly from a paver on the bank (paver behind crane in this scene). Trench draglined open immediately ahead of pipe laying

The contract was awarded May 1, 1947, to C. J. Langenfelder & Son, Inc., of Baltimore. In contrast with the experience of many other earth moving contractors through the past summer, the Langenfelder firm had very good weather breaks. On the 200th day, at the time of this editor's visit, it had moved 5,631,000 c.y. or 92% of the total, with a hundred days of limit time to go. But as usual the last phases were proving somewhat more troublesome, due in this case to uncovering of clay pockets.

75-Machine Outfit

The earth-moving outfit consisted of 13 tractors with dozers, 7 other tractors, 3 graders, 1 dragline for drainage work, 3 sheepsfoot units (each three drums, third drum being on a second axle), 11 14-yd. bottom dumps, 10 dump trucks, 9 12-yd. tractor-drawn scrapers, 2 2-yd. shovels, 1 elevating grader or loader, 13 10-yd. self-powered scrapers, 3 14-yd. self-powered scrapers, and miscellaneous equipment. Several "makes" were represented, since the contractor pur-



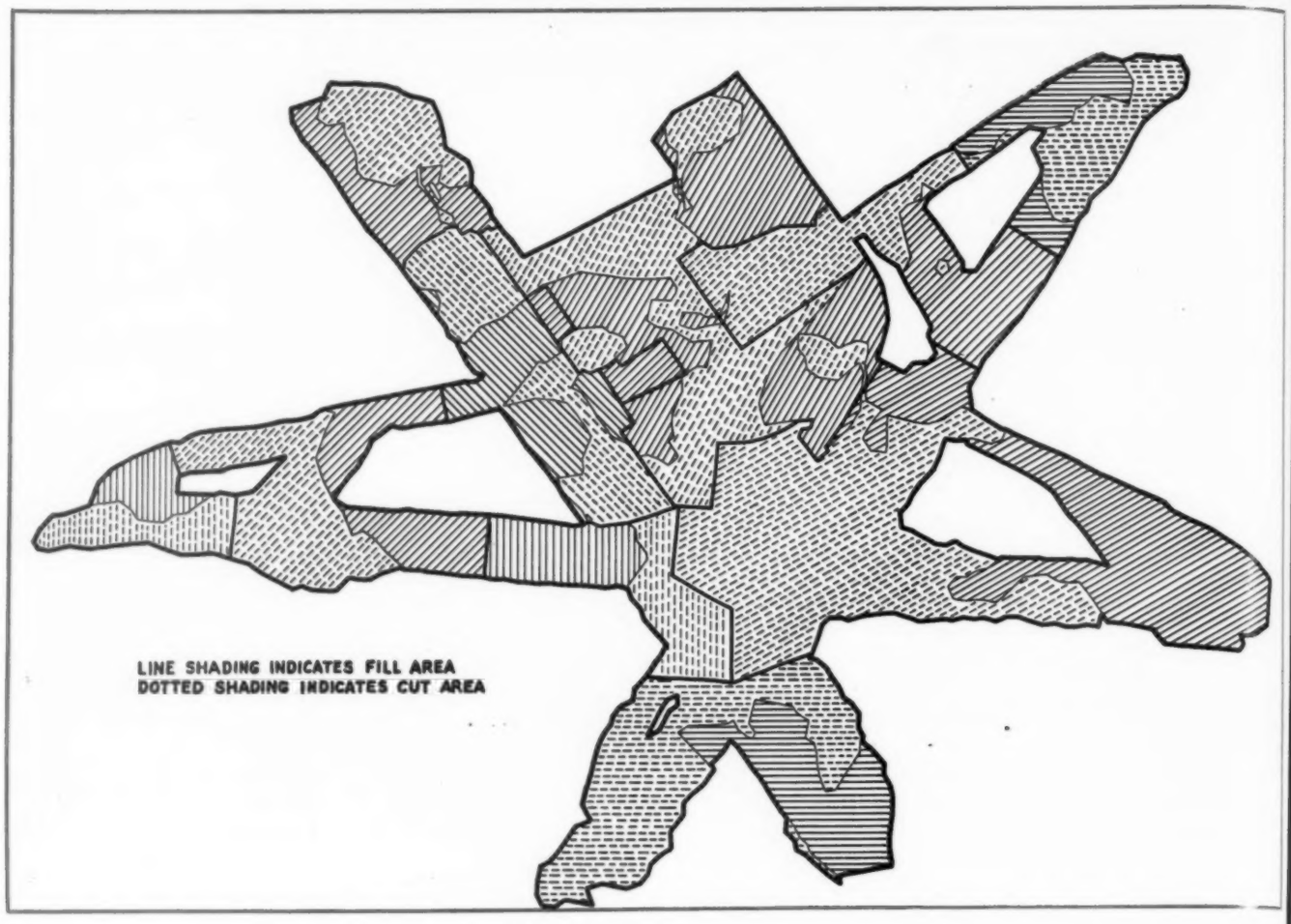
★ Sheepsfoot rollers were specified to have 7 in. high by 6½ sq. in. teeth, unit weight 525 psi.

★ Track sprockets worn by abrasion of sandy soil were built up by application of manganese welding rod to one side of teeth faces—done in this open-ended shop, using Langfelder's truck-mounted welder. Note dual tires, for sandy going

★ Superintendent Foster and "friend" —a scull of unknown antiquity unearthed by the shovel at 20 ft. depth

★ Heavy-duty half-track with boom and winch, 3 tons capacity, used for picking up big tires, casting, pumps, etc., in the field

★ Langenfelder company's 40 x 100 ft. concrete floored field shop, specially built for the Baltimore airfield job. Three bays on one side, built plenty high and wide to take the biggest new tractors and scrapers



★ How contractor on Baltimore airport balanced cut and fill by dividing job into 12 balanced areas. These areas are outlined in heavy lines, the light-broken and light-solid shaded lines of equal direction denoting cut and fill, respectively, within each balance area

★ CAA and project officials inspecting the big rig are (left to right): Joseph Mott, CAA; William Hendon, CAA paving engineer, New York; Henry Orron, soils engineer, CAA, Washington; B. H. Bigger, head of CAA paving branch, Washington; Theodore Kesting, CAA dist. engineer for Maryland; Graham Hevel, resident engineer for Whitman Requard, Greiner & Associates; Dr. J. A. Callon, CAA, Washington; J. W. Ruth, H. C. Foster, supt., and E. F. Purcell, project manager for Langenfelder; and William Jervis, with O. J. Porter & Co., consulting engineers

chased machines anywhere he could in order to put an all-new fleet on the job. During the season all manner of experimental models were also placed on the work by manufacturers.

Cuts reached 27 ft. maximum; fills, 30 ft. Haul averaged about 2300 ft., including some borrow from areas immediately adjacent to the field.

On a typical day, one 10-hour shift report showed that ten pans moved 9570 c.y., one shovel 2400 c.y., the elevating grader 4485 c.y., twelve 10-yd. self-powered scrapers 8760 c.y., and three 14-yd. self-powered rigs 2567 c.y., or a total of 27,784 c.y. for the shift. The total for the day was about 55,000 c.y.

Night work was expedited in no small measure by the use of three million-candle-power truck-mounted flood light units, (10 amp, 60 v. 3 ph) obtained from Navy surplus. Smaller flood units aided spot work.

All tires on this contract were of the same make; (Firestone) and the contractor benefited from an unusual deal in which a Baltimore tire distributor agreed to be responsible for checking tire pressures on the job each morning and keeping tires repaired.

Tires as well as repair parts up to a ton or more in weight, were handled in the field by means of a military-type half-track vehicle with forward boom and winch. Termed the "most useful machine on the job," it was kept constantly busy, proving to be an ideal solution for the problem of a service unit that could negotiate sand all day.

Sandy jobs like this, while making for easy excavation, are hard on equipment. The lessons that Langen-

LOOK TO UNIVERSAL FOR

COST-CUTTING OUTPUT OF UNIFORM AGGREGATE

ORE TONS ER HOUR

ROCK PLANTS

546-P primary jaw crusher with 800 Series secondary roll crushing, screening, and loading unit.

LIME PLANTS

1800 Series secondary hammermill plant for producing aglime or road rock.

LESS COST PER TON

WASHING PLANTS

Crushing, screening and washing plant with primary jaw crusher, secondary rolls, scrubber, classifier, conveyors and bins.

GRAVEL PLANTS

The TwinDual Master 24. Twice the capacity of conventional gravel plants of comparable weight. Three stages of reduction with primary jaw crusher and TwinDual* rolls.*

* PATENTED

FOR PRODUCTION AT A COST THAT LEAVES MORE PROFIT

BUY UNIVERSAL

Universal "Stream-Flo" Engineering provides the perfect balance of high capacity units to assure steady flow of properly graded material. No starving, no glutting . . . results in more tons per hour at less cost per ton. Meet today's demands for more production at bid-winning costs with Universal crushing, screening, washing and loading plants. Investigate. Compare. Write for literature today.

UNIVERSAL ENGINEERING CORPORATION

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ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL AND LIME PLANTS—SCREENING AND WASHING PLANTS—CONVEYORS—APRON FEEDERS

★ Water truck—six tires for sandy soil, two spray bars (fore and aft of rear wheels)

★ Million-candle-power flood—one of three used

felder's men learned include:

(1) You must count on more rapid wear of tracks in sandy going, due to abrasion. Tractor tracks were overhauled after 700 to 1,000 hours of service, being fitted with new track pin bushings, and worn sprockets were built up with manganese welding rod. After a second period of service the tracks were replaced.

(2) It was found best to use snatch rather than push loaders on self-powered scrapers, in order to save strain clutch wear. Constant maneuvering to steer machines while being push loaded in loose ground was thus avoided.

(3) Be sure to have enough traction and power on such equipment as service and water trucks. For example, here the 3,000-gal. sprinkler tank was mounted on a heavy-6-tired truck. This truck, by the way, had a sprinkler bar in front as well as behind the car wheels.

The airport project is being financed by bond proceeds and its construction and management are under the Department of Aviation, City of Baltimore. Gen. Cecil R. Moore, who was U. S. Army chief engineer, European theater, during the war, is director. Whitman - Requardt - Greiner Associates, of Baltimore, are the engineers, with Everett Bevin, project engineer and G. R. Hevell, resident engineer. Drainage was sublet to M. J. Bles, McLean, Va. C. J. Langenfelder & Sons, Inc., contractor, is represented by Joseph McGinnis, project manager, and Edward F. Purcell, general superintendent.

●

AAA Sets up Safety Foundation—Acting to expand its safety program, particularly its work in the field of driver training, the American Automobile Association has set up the AAA Traffic Safety Foundation, a separate, non-profit organization.

All Set for AED Annual Meeting Feb. 15-19, Chicago

AN ACTION-packed series of hard-hitting talks and discussion meetings are in store for members attending the 29th Annual Meeting of the Associated Equipment Distributors in Chicago's Edgewater Beach Hotel, Feb. 15-19. Harry J. Hush of New York is convention chairman.

★ W. A. Danner, AED President of Boston Associated Equipment Distributors

Consideration will be given to present and anticipated problems facing the construction industry, Hush said, and it is expected that a great many workable ideas and suggestions will result. Speakers, announced thus far, include:

Ed Wimmer, Vice Pres., National Federation of Small Business; James A. White, Columbus, Ohio, prominent attorney, author and educator.

E. Charles Eichenbaum, Little Rock, Ark., Chairman, Federal Excise Tax Section of the American Bar Association and Vice President, Lyons Machinery Company, on "Tax Planning for Buyer and Seller"; Col. Robert J. Fleming, Jr., Corps of Engineers, Washington, D. C., who will explain the importance of the Army's specialist reserve units to national preparedness.

The convention committee will meet in Chicago January 21, 22 and 23 with AED President W. A. Danner, Boston, to complete final plans for the program.

Commenting on the tentative program, President Danner says: "We feel that the Committee has done an excellent job of planning to meet the needs of both distributor and manufacturer members. Sessions will be long enough to do the job, yet short enough to provide plenty of time for manufacturer-distributor contacts."

Two and one-half of the five meeting days will be devoted to Meeting Sessions. The remaining time will be open for sales meetings and discussion groups arranged by the various manufacturers with their distributors.

●

Minnesota Highway Expenditures Increase—Minnesota state, county and local governments spent $26,985,691 for road and street construction and $28,879,804 for maintenance in 1946, or a total of $55,865,495. The total was nearly nine million over the $46,975,477 spent in 1941, last prewar year. Construction in 1946 was less than a million over the $26,002,702 spent in 1941, but maintenance outlays were nearly eight million above the $20,972,775 total in 1941, due mainly to higher costs and to repairs deferred during the war.

The 1946 totals are nearly double the amount spent in 1943, when construction was at low ebb, due to wartime restrictions. In that year $7,135,328 was spent for construction and $21,347,163 for maintenance, a total of $28,482,491.

Probable Continuance of Wage and Price Increases

By Halbert P. Gillette

PER capita currency in circulation is $198 as compared with $53 about 27 years ago when average commodity prices had reached the peak after World War I. Commodity prices now are about as high as then, and many men think these prices will go no higher. But it is not probable that this postwar peak will be the same as that of World War I; for per capita money now is nearly four-fold what it was then; whereas per capita production of commodities has increased less than 10% in 10 years.

As far back as American records show per capita currency and average wage rates, the two had risen in about the same proportion until our government tried to control wages during the recent war. The control was only partly successful, for factory wages are now about $200 a month and still rising, as compared with about $100 in 1939.

Average annual wages in American factories, as shown by U. S. censuses between 1849 and 1939, have never differed long from 20 times the per capita money in circulation. But at present they are only about 12 times the per capita money.

Since factory wages have been typical of the general average of wages, I infer that the further increase of average wages will be about 50 or 60% and is apt to occur at the rate of about 15 or 20% annually. Business men who count on a halt at about present levels are in for a sad surprise. Sadder, perhaps, will be the surprise of politicians who are urging federal controls of inflation by one means or another.

At present the President is seeking authority from Congress to limit bank credits and to ration, at the sources, the sales of basic industrial materials, such as metals. He has vetoed two bills reducing income taxes, mainly on the ground that inflation can be partly resisted by maintaining very high income taxes. His reasoning is that if a paternal government holds down the "take-home money" in pay envelopes, less cash will be available for the purchase of goods. But he fails to "follow through" by showing what becomes of the tax money. The truth is that none of it has ceased existing and circulating. Tom, the tailor, is taxed so that Sam, the navy sailor, can get his "board and keep." And so money's merry-go-round continues and will continue in America unless we give some of it away to foreigners or forcibly retire some of it from circulation. Truman has at no time suggested either course.

Taxes never have been popular, and never more unpopular than now. Hence, it is safe to expect that no Congress will favor maintaining present burdensome taxes in order to retire some of the inflated currency from circulation. Yet unless a great deal is thus retired, both wages and prices will go on rising for about three or four years more—provided, of course, that a severe business depression is not the consequence of federal attempts to check inflation.

To urge people to go on a "buyer's strike," as Truman has urged, is itself dangerous advice. If very many people accept that advice, then very many people will soon be jobless, including many who have engaged in the "buyer's strike." All that is needed to launch a depression is a wide cessation of buying, and it matters not what is the motive behind the cessation.

We read a great deal about the need of curbing further price inflation by increasing production, but never is anything said as to how far that can be reasonably expected to act as a curb. Barron's Index of the production of goods in America shows a monthly output about 18% greater than the average monthly output in 1935-39, when we were still in the long depression. But as our population has increased about 7% since then, the per capita increase in the production of physical goods has been less than 10% in more than a decade. During the half century prior to that depression, per capita increase in productivity was at the rate of about 20% per decade. What has caused this startling slump. Is it dislocations due to a long war? Scarcely, for nearly 2-5 years have passed since the war ended. Is it the shortening of the working week? That has been one factor, but more important, perhaps, has been labor-loafing. Complaints about this have come, and still come, from many reliable sources since the war's end.

Even if we get back to an increase of per capita productivity of 20% per decade, it probably will take several decades to bring average commodity prices back to the prewar level—provided, of course, that another long, severe depression does not occur.

It is well to bear in mind the three basic causes of the 20% per decade increase in American per capita productivity: First, a goodly percentage of scientists, inventors and efficient engineers; second, capable owners and managers freely operating under the profit motive; and, third, staffs of workers similarly activated and intelligent enough to know that real wages, in the long run, are proportional to productivity.

Specialized Training for Traffic Officers

The University of California will offer specialized training for traffic police personnel on its Berkeley and Los Angeles campuses during February and early March. Police from 11 western states are eligible to attend the courses which are offered by the university in cooperation with the Traffic Division of the International Association of Chiefs of Police. Called the Western Traffic Police Institute, the course will be offered on the Berkeley campus Feb. 9 to 21, and then repeated on the Los Angeles campus of the university Feb. 23 to March 6.

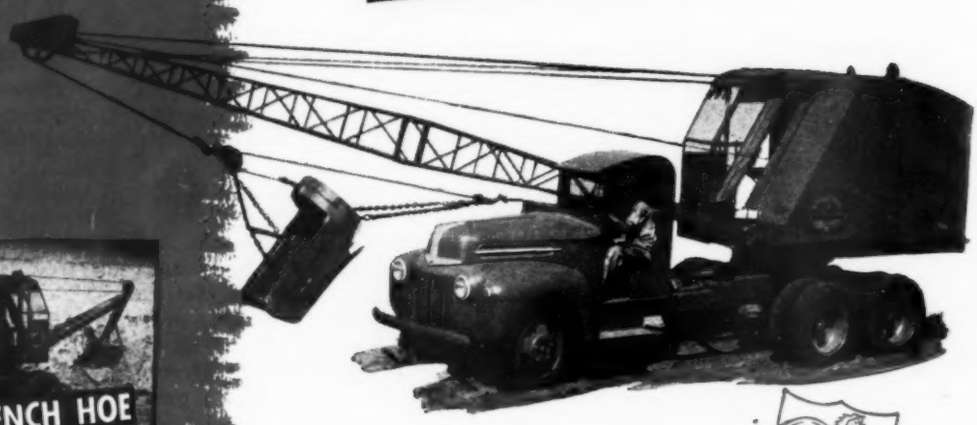
Fabricated Structural Steel Bookings

According to reports received by the American Institute of Steel Construction, the estimated total bookings of fabricated structural steel for the first 11 months of the year 1947 have totaled 1,473,205 tons or 7.8% increase over the same averaged months in the five prewar years 1936/1940. November bookings amounted to 126,264 tons. November shipments totaled 153,875 tons. Shipments for the first 11 months totaled 1,704,832 tons, an increase of 26.9% over the same months in the prewar years. The tonnage available for fabrication as of Nov. 30th was 645,440 tons.

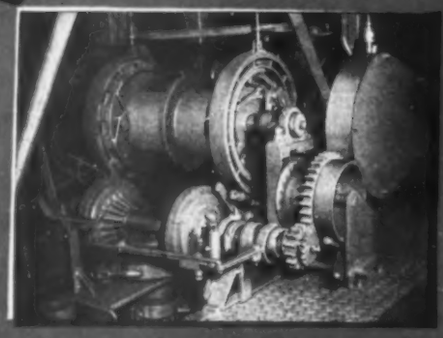
•

Ohio Roadside Parks—The State Highway Department of Ohio maintains more than 300 small parks along state highways. Approximately 4,500,000 persons visit these parks each year.

VERSATILITY PLUS MOBILITY



The "HEART OF THE BANTAM"



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- No strain on center pin
- Full circle design
- High strength alloy construction
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- Easy maintenance

BANTAM

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PORTABLE DRAGLINE • CLAM • SHOVEL
TRENCH HOE • PILEDRIVER • CRANE

There's no limit to the everyday jobs for the Schield BANTAM or the time, labor, and money it can save. It travels the highway at truck speeds . . . drives up to the job and digs in. Mounts on any 1½ ton truck and goes wherever the truck will go. Unbeatable for versatility and economical performance in close quarters.

Its FAST CYCLE operation piles up yardage. *Ball bearings* on all major assemblies add to speed and ease of handling—keep maintenance costs low. Changing from dragline to clam, shovel, trench hoe, piledriver, or crane is a matter of minutes. Split-type laggings allow proper line speeds and guarantee profit-making performance on all operations.

Talk to any Schield BANTAM owner and learn the facts about its low cost, smooth operation, easy maintenance, and capacity for getting jobs done. Then see your dealer about delivery.

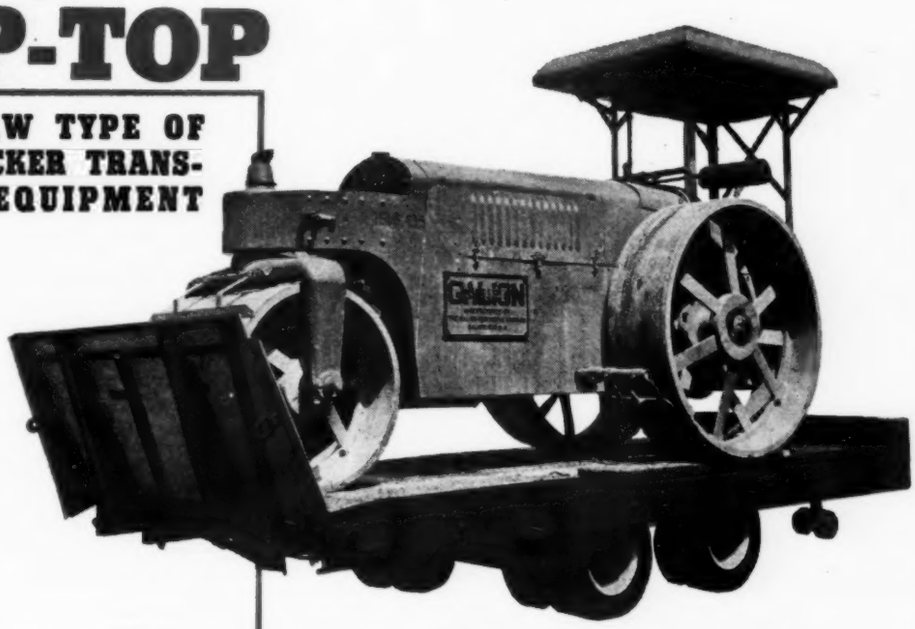
Your name and address on a Post Card will bring you illustrated literature. WRITE TODAY.

THE PERFECT TEAM-MATE
FOR YOUR LARGER EQUIPMENT

THE SCHIELD BANTAM CO., INC.
203 PARK STREET WAVERLY, IOWA

Introducing TIP-TOP

AN ENTIRELY NEW TYPE OF TRAILER FOR QUICKER TRANSPORTATION OF EQUIPMENT



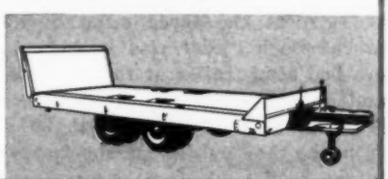
Now, for the first time, TIP-TOP Trailers reduce to a matter of minutes the loading or unloading of all types of equipment such as Tractors, Bulldozers, Road Rollers, Trenching Machines, etc. Faster, safer, easier, this revolutionary new development in trailer design eliminates all need for blocking, skidding or winching.

Sturdily constructed with pressed steel frames, TIP-TOP Trailers are available in 7-ton capacity (single axle) or 12-ton capacity (tandem axle) and provide a liberal factor of safety for unavoidable overloads. Also, where desired, special capacity sizes can be made to specifications.

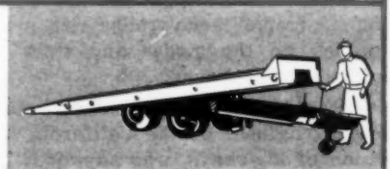
TIP-TOP Trailers are equipped with approved lights and reflectors, vacuum, air or electric brakes and comply with all state laws.

TIP-TOP TRAILERS MAKE LOADING and UNLOADING AS SIMPLE AS THIS!

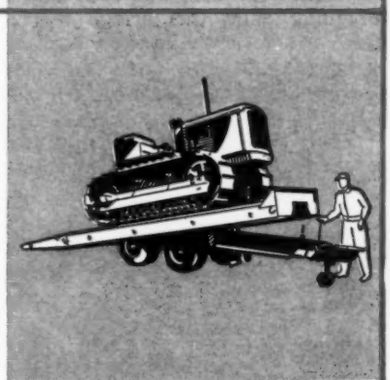
1. Trailer before loading.



2. Tail skid is lowered and loading platform is raised by hydraulically controlled, hand operated pump.



3. Equipment is driven on under its own power with tail skid serving as ramp. Release valve is then opened so that loading platform will return to its original position and automatically lock. The tail skid is then hydraulically raised to shorten overall vehicle length and to serve as barrier for load.
In unloading, same procedure is followed and equipment is driven off under its own power.



INQUIRIES AS TO OPEN TERRITORIES ARE INVITED FROM QUALIFIED DISTRIBUTORS.

TIP-TOP TRAILERS

Patent Pending

ARTHUR REHBERGER & SON, Inc.
320 Ferry Street Newark 5, N. J.

For additional information on TIP-TOP Trailers, write for folder R.

JOB and EQUIPMENT IDEAS

How to Haul 125-ft. Girders

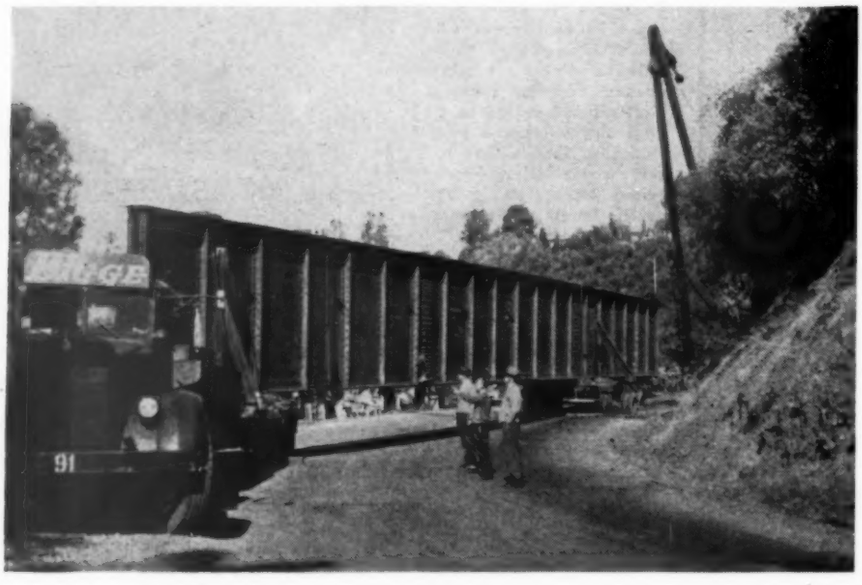
How would you go about moving two big 125-ft., 41.5-ton steel girders over a crooked mountain road?

Out in California the J. D. O'Brien Company of Stockton had this task to perform, as part of their sub-contract to build a bridge across the North Fork of the American River near the town of Auburn. The girders were 10 ft. deep. O'Brien hired the Bigge Draying Company of Oakland to haul the girders the three miles of distance. Each girder was loaded on a low-bed semi-trailer at the front end, and supported on a bolster, with a steering dolly located about 30 ft. from the rear end. When short curves in the road made it necessary, a 60-ton "A-frame" semi-trailer was used to pick up the girder and steer it around obstructions.

According to Fred G. Panhorst, bridge engineer of the California division of highways, who supplied the foregoing data, this bridge will replace an old suspension span on the road which connects Auburn and Placerville via Coloma, where gold was first discovered in 1848. O'Brien's work is under the general contract of H. W. Ruby of Sacramento. Columbia Steel Co. furnished the steel, which was fabricated by Virginia Bridge Co., Memphis, Tenn.

★ In the rear is an A-frame rear boom, mounted on a semi-trailer, with power hoist located at the forward end of the bed. This boom was used to lift the rear end of the girder around, to help in past curves.

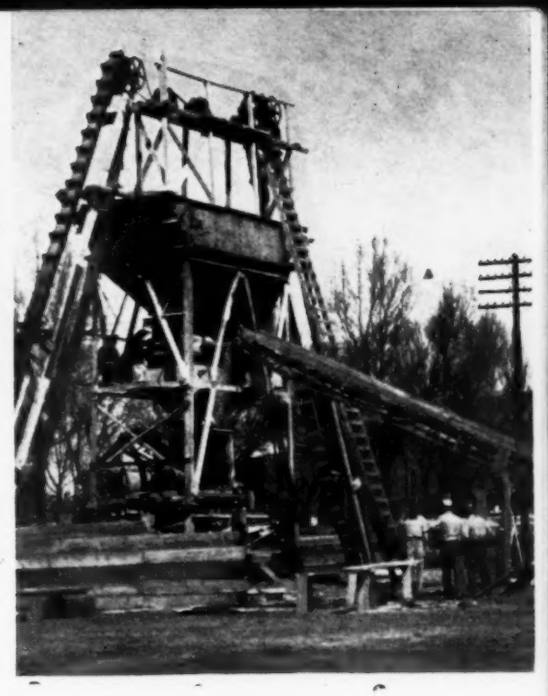
★ At times, on sharp mountain road turns, the girder was temporarily in the position of a "chord." Towing trailer is in shadow at right, assisting A-frame out of camera range at left



★ Girder being snaked round a road curve. Note rear dolly

Aggregates Get High Bucket Ride

This unusual batching plant set-up was employed by Frank M. Kenney, Denver contractor, on a concrete underpass job at Raton Pass, New Mexico, in 1946. Screened aggregates,



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brought in by rail, were delivered to the bins by the two bucket lines. Proportioned stone and sand fed by gravity into a stationary mixer set under the bins. Bin capacity 20 yd. Cement was delivered to a chute and into the mixer via a belt from a storage shed at the right.

Oiled Dowels Stored Under Tarp

Another noteworthy item of W. L. Johnson Construction Co.'s work at Patterson Field, is the care with which this firm stored the huge quantity 2½-in.-diam. dowels required for concrete pavement. The snapshot shows the stockpile, broken into and being exhausted as paving progressed. Dowels were successfully protected against rusting through the previous winter by careful oiling and enclosure under heavy canvas. Dowels rested in wood plank sleepers.

Handy Tank-Filling Arrangement

A neat job is this welded pipe riser and spout mounted on a portable 4-in. pump, which was designated to just fit the height and width of Utah Construction Company's sprinkler trucks at Panguitch airport, southern Utah, 2000-gal. tank filled in 5 min.

Toll Road Legislation in 1947

Legislation authorizing the construction of new toll roads or extension of existing turnpikes enacted in 8 states during 1947, is summarized as follows in a paper prepared for the Highway Research Board by Yule Fisher, Assistant Research Counsel, National Highway Users Conference:

Statutory authority for construction of new toll roads was granted in five states—Colorado, Georgia, New Hampshire, Oklahoma and West Virginia. In Colorado, the State Highway Department was authorized to construct turnpikes and finance them by tolls. The project under primary consideration is a 4-lane highway between Denver and Boulder. The Georgia Legislature authorized the construction of a toll highway by the Georgia Coastal Scenic Highway Commission (consisting of representatives from Camden, Glynn and McIntosh counties, as well as representatives from other coastal counties who may wish to participate)*. Construction of a 18-mile toll highway across the southeast corner of the state from Seabrook to Portsmouth is provided by New Hampshire law. Unlike provisions in other states, the funds are to be raised through pledging the credit of the state, up to $7,500,000. Issuance of bonds and construction of the highway are conditioned upon the making of a complete traffic survey and the finding of feasibility and practicability of the proposed toll road.

The Oklahoma Turnpike Authority was created, with authority to construct a toll express highway between Oklahoma City and Tulsa. Construction of the highway must begin within two years from the effective date of the Act (Aug. 6, 1947). Estimates of costs have varied from $25,000,000 to $50,000,000.

Wide authority in the construction of toll roads in West Virginia is provided by legislation creating the West Virginia Turnpike Commission. Thus far, no specific routes have been announced by the Commission.

Four other states have enacted varying toll road legislation. The California Legislature codified and amplified the authority of the California Toll Bridge Authority, relating to toll roads and bridges. At the same time, the Legislature rejected extensive plans for a network of toll roads, one of which contemplated a $2,000,000,000 system. Maryland revised and enlarged the existing authority for construction of toll roads, especially as to the construction of auxiliary facilities, refunding of bonds, and the granting of concessions.

New York legislation provides for the collection of tolls on the Fleetwood Viaduct for the retirement of Westchester County Parkway bonds. A Pennsylvania enactment authorizes combining the revenues of the Pennsylvania Turnpike with those of the proposed eastern and western extensions in order to finance the cost of such extensions, and the refunding of any turnpike bonds. The Governor vetoed a bill empowering joint action with Ohio, West Virginia and Indiana in the westerly extension of the Turnpike.

Toll road legislation was defeated in Connecticut, Florida, Maine, Ohio and Washington.

*In view of its passage as a local law, there is question as to the constitutionality of this statute.

"SOME BIG CONSTRUCTION JOB GOING ON DOWN THERE"

"YEAH! GOOD JOB, TOO! THEY'RE USING

HELTZEL STEEL FORMS

Airport, highway, sidewalk, curb and gutter, or whatever job it might be, there are sure to be Heltzel Steel Forms in the picture. You depend on Heltzel because their concentrated engineering has worked every detail to practical purpose. Each exclusive feature added has eliminated another problem for you.

Heltzel Standard 1/4" Form

The same practical engineering that designed the special dual duty forms for the Patterson Field job is found in every Heltzel Steel Form. The standard form (illustrated above) is built to last, handle easily, and produce a better job. Moved from job to job, year in and year out, they set quickly, interlock smoothly, and strip away easily. They stay rigid because THE SINGLE WEDGE POCKET HOLDS STAKES FIRM—they can't vibrate loose.

Special Heltzel dual duty forms at Patterson Field carried the heaviest construction equipment ever supported by any forms. The same set of forms were used for both 21" and 25" slabs.

Heltzel
BUILDS IT BETTER

- BINS, Portable and Stationary
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Send me the following:

[ ] B-19 Steel Highway and Airport Forms

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Lime Used in Airfield Base

Hydrated Lime Employed in Base Construction of Chase Field

Many interesting facts and stories are now being gradually brought to light in connection with the vast military air base construction program during the war. Some interesting facts concern the construction of Chase Field, Beeville, Texas, where hydrated lime was used to lower the PI of the soil.

This particular project was originally sponsored and financed by the Civil Aeronautics Administration in the first part of 1943. The actual construction work was placed under the supervision of the Corps of Engineers, Galveston, Texas. However, shortly after the completion of this air field in the spring of 1943, the whole base was transferred to the Navy under the jurisdiction of the Naval Air Station, Corpus Christi, Texas.

The base course was originally designed as a crushed caliche base course with a PI specification of 10 or less as required by Civil Aeronautics Administration. It was soon found that this Plasticity Index requirement could not be met with the local caliche material available which had an average PI of 15. Suitable material meeting the PI requirements could not be found within reasonable hauling distance from the field. As a result, it was decided to stabilize the local materials with an additive.

The Corps of Engineers ran tests in their soils laboratory on the base material using various stabilizing agents. It was found that the PI could be lowered most economically to the required level with 2 to 3% hydrated lime. At first lime was added 2½% by weight to the soil, but was subsequently reduced to 2% when it was discovered that the plasticity of the caliche was lowered more than expected. The lime admixture was added to the base material on the runways by mixing with a Woods road mixer and compacted with sheepsfoot rollers in standard manner. The original PI, which ranged from 10 to 20, was reduced to 2 to 8, averaging 5 (well under the specification limit).

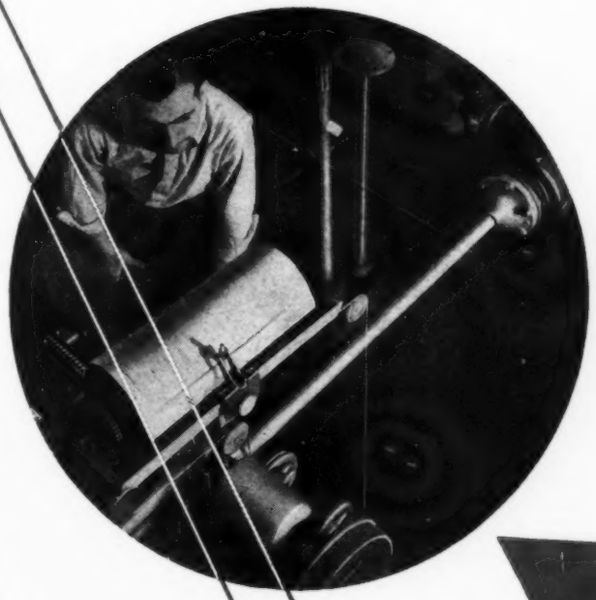
Considering that unstable soils were used in the base course (according to PRA system of soil classification A-6 and A-7 soils predominated), it is interesting to note that the runways gave satisfactory service and are still in good condition four and one-half years later. The base materials averaged 6 inches in thickness with 1 to 2 inches of Uvalde rock asphalt surfacing. The total thickness of this

(*Continued on page* 107)

you get more work out of Mack Trucks

Cost-conscious highway maintenance men know that the true measure of a truck is the way it pays off—in work. They know, too, that when it comes to working harder and lasting longer . . . at lowest cost, there's nothing for road building to beat a Mack. This hard-working Mack serves Richfield Street Dept., Richfield, Minn.

because..we put more work into Macks

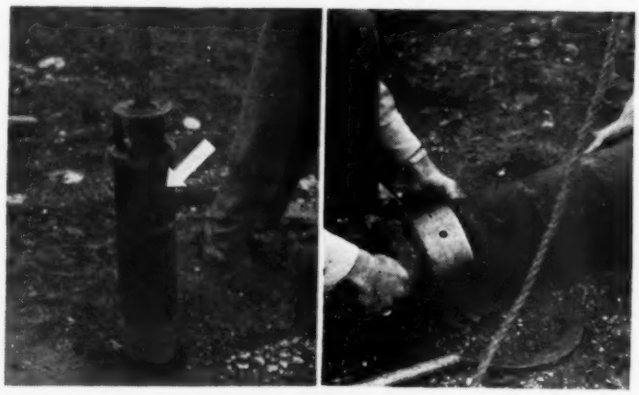


There is no guesswork about the stamina of Mack parts. This testing machine determines the strength and elasticity of Mack axle shafts by imposing measured torque up to point of fracture. Sample shafts are tested to destruction, thus insuring that all Mack shafts fully measure up to Mack's exacting standards.

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada, Ltd.

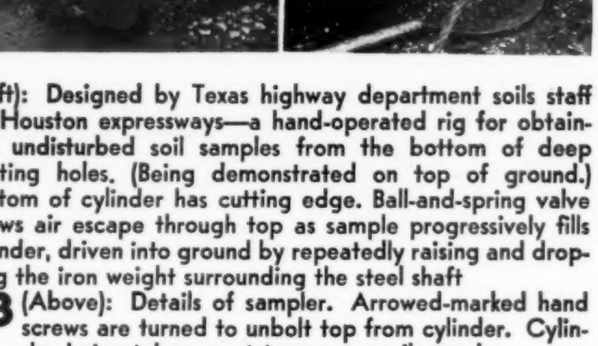
6218

SINCE 1900, AMERICA'S HARDEST-WORKING TRUCK



1 (Left): Designed by Texas highway department soils staff on Houston expressways—a hand-operated rig for obtaining undisturbed soil samples from the bottom of deep footing holes. (Being demonstrated on top of ground.) Bottom of cylinder has cutting edge. Ball-and-spring valve allows air escape through top as sample progressively fills cylinder, driven into ground by repeatedly raising and dropping the iron weight surrounding the steel shaft

2-3 (Above): Details of sampler. Arrowed-marked hand screws are turned to unbolt top from cylinder. Cylinder being taken apart to remove soil sample



4-5 Typical undisturbed sample before placing in carrying mould. Circular porous stone filler plates—one or more are set in bottom of carrying container to act as base under specimen so that specimen will protrude slightly above top of cylinder

Undisturbed Soil Sampler devised for use

on Houston expressways—see opp. page

6 Specimen set into cylinder and top being trimmed with penknife

7 Top plate in position—ready for trip to the lab.

Hand Apparatus for Taking Undisturbed Soil Samples

(See Opposite Page)

Shown on the opposite page is a home-made sampling device, made specially to expedite the taking of undisturbed soil samples from the bottom of belled footing holes for concrete pier foundations. This type of pier footing for interchange structures at Houston, together with power equipment for drilling and belling the holes, was described in July '47 R. and S.

The apparatus was devised by F. A. Harris working under the direction of W. J. Van London, engineer-manager, Houston Urban Expressways. As described by Mr. Van London, it takes 6-in. diameter undisturbed specimens for the purpose of determining the bearing value of the natural soil at various depths. Samples are being taken with this equipment in completed earthwork as well as in the bottoms of footing structure holes, as one means of checking compaction results.

Precast Deck Slabs for Small Bridges

Among the off-beaten-path methods employed by the Pennsylvania department of highways during the past year is that of re-building several small bridges with precast concrete deck slabs, using the vacuum process in slab construction. The idea of precast slabs is several decades old, being widely employed on railway bridge construction as a means of saving detour time, labor, transportation of materials and the need of setting up a plant or mixer at the site.

The accompanying photos show a typical small secondary road bridge so modernized in recent months. The individual slabs, of inverted "channel" cross-section, were built to dimensions small enough for convenient handling. The slabs were built with the cooperation of a Philadelphia concern.

According to L. A. Porter, bridge engineer of the highway department, precast deck construction appears to have many uses and is expected to prove of aid in future bridge work, both contract and maintenance.

Arterial Towing Service

For greater safety and improved service to the public, the New Jersey highway department plans to tow disabled vehicles from the Pulaski Skyway between Newark and Jersey City, using jeeps.

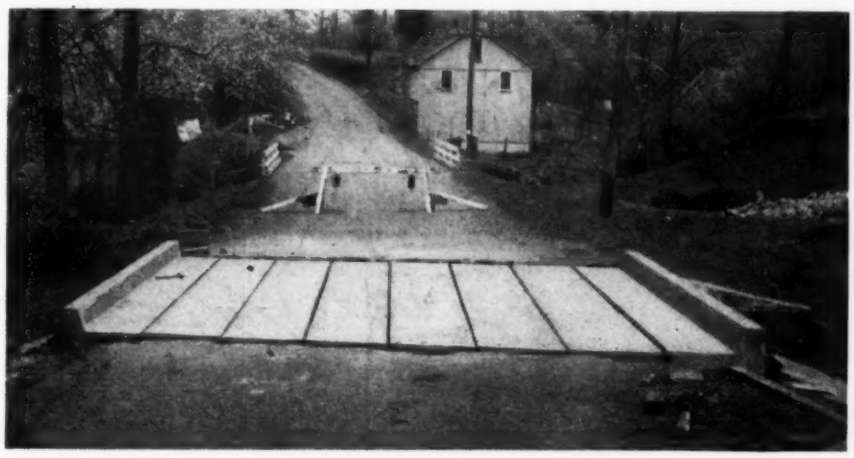
The three-mile elevated roadway will be patrolled to permit quick aid but in addition Commissioner Spencer Miller, Jr., has ordered two-way telephone equipment. This inter-communication device will permit Jersey City, Newark and the Hudson County police to direct the driver in emergency calls. The tow with hoist equipment will be manned by highway department employees and will be available from 6 a. m. to 10 p. m.

States Increase Gas Tax

Legislatures of eight states in 1947 enacted laws providing for increases in the tax rates for motor fuel. In addition provision was made for increasing the rate in the District of Columbia. The states with the increased tax and resultant rate are as follows:

	Increase Per Gal. Cents	New Rate Per Gal. Cents	Est. Additional Annual Revenue
California	1.5	4.5	$39,656,000
Colorado	2	6	5,800,000
Connecticut	1	4	4,000,000
Maine	2	6	3,500,000
Maryland	1	5	3,700,000
Rhode Island	1	4	1,400,000
Vermont	.5	4.5	400,000
Dist. of Col.	1	4	1,500,000
			$59,956,000

Nevada provided a 1.5 cents increase with local option in counties to accept or reject the increase.



★ Details of a typical small bridge for which precast slabs are said to be an economy as well as a means of reducing detour times

LUBE MEMO
Easy way to end sticky valve trouble
Sticky gum on our valves
Ex. valve on #1 isn't closing —loss of compression and power.
Nelson says compounds in RPM DELO Diesel Engine Lubricating Oil keeps valves free 3 ways:
1. Anti-oxidant stops gum formation
2. Metal adherent keeps oil film on stem— prevents wear.
3. Detergent cleans away carbon deposits.
Nelson brags RPM DELO Oil keeps his valves clean as a whistle.
DIESEL ENGINE
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STANDARD OF CALIFORNIA • San Francisco, Calif.
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Long-Range Planning Studies

What the various state highway departments are (or aren't) doing to get on with planning as a basis for sound highway modernization, as reported in a paper at recent Highway Research Board annual meeting.

By G. Donald Kennedy
Vice President, Automotive Safety Foundation, Washington, D. C.

ADDRESSING a highway planning symposium at the University of Michigan in February, 1938, Herbert S. Fairbank of PRA outlined the objectives of the planning surveys which were then in their second year by saying that "the highway planning survey is not a report. It is a full length view of our highway situation and it fits the day-to-day needs of commonsense highway administration. . . . The establishment of a road program rationally developed is the final objective of the highway planning survey."

In the short period between Mr. Fairbank's remarks and the start of World War II noticeable progress was made towards the objective he outlined, the surveys having furnished a variety of new and useful tools to highway administrators, thereby aiding them in the fulfillment of their public duties in the best possible manner.

Much Done to Date

Major accomplishments resulting from the surveys included the preparation of road inventory maps and diagrams; complete analyses of highway traffic; study of auto trip lengths and the exploration of traffic volume variations; careful investigation into the demand on highway systems by urban and rural users; and detailed compilations of public finance.

In addition to these were studies of apportionment of road user taxes; of highway costs and studies of vehicle movements and of vehicle sizes and weights so that the life expectancy of our present road plant is well understood.

These are but a few of the accomplishments of the continuing operation we call the Highway Planning Survey as carried on jointly by state highway departments and the Public Roads Administration under the terms of the Federal Highway Act.

The war's impact placed a tremendous burden on our highway plant as the replacement of worn-out and obsolete road sections was almost completely curtailed and manpower shortages placed severe restrictions on planning research.

The 1944 amendment to the Highway Act, expanding planning work, is a result of a new awareness of the surveys' importance to road management problems. Congressional provision for a 3-year postwar program in Dec., 1944, restored the opportunity for even greater achievement by planning agencies.

Now state legislative bodies have placed a burden on the planning surveys, as information is sought on which to base the programs so essential to restore and advance highway systems. Beset on several sides by postwar demands for state financial assistance, legislators have been perplexed in attempting to solve highway needs and in deciding how tax income should be apportioned to the governmental jurisdictions controlling roads.

New Approach Developed

This dilemma has brought about a new approach to highway programming, but the data and methods devised in 12 years of highway surveys are still the foundation and chief source of information.

With administrators and legislators alike now seeking the immediate establishment of sound road programs the ultimate objective of the surveys becomes immediate and calls for reporting of the first rank.

An appropriate analogy between the continuing operations of the planning survey and the type of reporting now being accepted may clarify this relationship. The engineer who is engaged in stream gauging seeks to determine the dynamics and flow of a wide and deep river. He must observe the differences in current at varying points in the river's cross section and study the water's velocity to gauge the total product of the stream.

The present studies of highways at this particular point in time cut across the flow of highway planning work to measure activities in progress at many different points. Such an activity, it seems, might well be justified at perhaps 10-year intervals.

What, then, should be the scope of the current long-range studies for highway modernization programs?

Planning Aims?

To solve the problems facing the administrators, engineers and legislators, they must project into the future. This means studying the impact of motor transportation on the state's future economy and it means particularly studying any important changes in the character of motor transport likely to be developed by vehicles or drivers.

To do this we must project important indices based on trends already fairly apparent.

Such data must include population studies, motor vehicle registrations, especially larger trucks, vehicle use in terms of mileage and fuel consumption, the occurrence of accidents and the history of the system's development.

Further, we must study the nature of road use, traffic pattern variations, travel origin and destination, speed problems, the kind of vehicles in use and other elements of traffic and human behavior. Roads must also be classified according to a pattern of use and jurisdiction and a recommended classification plan prepared as an approach to the problem of road need determination.

Standards for road improvement are those which may be adopted when a road is rebuilt or which can be tolerated for a number of years until there are funds available to rebuild it.

In order to secure the most economical and effective maintenance and the most efficient traffic control, standards for highway operation as well as construction must be accepted. Expansion of the data to extend to all city streets and county roads is imperative. Obviously the study involves every phase of highway engineering practice.

From facts thus harvested, then, a program of needs can be prepared with cost estimates determined for a given number of years, as it is only by the application of this all-inclusive technique that a state can arrive at

a thorough and dependable long-range highway modernization program.

Skillful Presentation

Especially important is the physical make-up of the finished study. It is essential that all technical verbiage and exposition be distilled thoroughly so that the report in its final printed form can be clearly understood by the non-professional mind. In this connection graphs, charts, photographs and other visual devices for explaining conclusions or facts in many cases will serve a better purpose, from the point of view of the lay intellect, than will written discussion. The physical make-up of the report should be, of course, as attractive as can be devised by modern publishing standards. This process of study and reporting has been approved by such organizations as AASHO, PRA and the Highway Research.

The purpose of this paper is to explore the extent to which states are now engaged in this type of activity and the kind of arrangements made for its execution.

To accomplish this purpose, a preliminary questionnaire was sent to the various states through the offices of the Highway Research Board in October, 1947, to determine whether or not such activity was contemplated. On the basis of information derived from this questionnaire a second and more extensive set of questions was sent to states which indicated plans for long-range studies. These well-answered inquiries have been utilized in preparing this paper. Other records, too, have been examined, including many state planning reports.

Who Sponsors?

We especially wanted to ascertain whether a particular study is sponsored by a legislature, a highway department, a highway user group, or some other agency. We are interested in knowing whether it includes urban streets and county roads as well as state highways; the method of financing; to whom the survey is addressed and whether or not it will find its way into the legislative halls; what organizational effort is being made for the survey; and the study's scope and the objective information to be obtained.

State Studies Under Way or Complete

California, the nation's fastest growing state, is where necessity first created demand for this type of study. In 1945, the legislature authorized creation of an interim fact-finding committee with seven members from each house and an advisory group made up of highway users and public officials to study the state's highway needs and to report its findings to the 1947 session.

The Automotive Safety Foundation loaned staff to study the engineering phases of the problem. Bertram Lindman surveyed the financial and tax aspects.

In all, $130,000 was appropriated by the state. The results were reported to the interim committee, which then presented its recommendations to the legislature. The California survey was based on all the factors mentioned earlier as proper and essential elements of such a study.

Pennsylvania in 1946 engaged the Brookings Institution to make a study of highway taxation and its allocation to local jurisdictions. This study indicated a need for improved administrative techniques as well as jurisdictional changes and the state now plans a survey of its roads to be completed Jan. 1, 1949.

Michigan's needs also demanded such a report for chief automobile producing state. The Michigan Good Roads Federation, a non-profit organization with a long background of successful support for highway development, raised funds and secured a director to complete a thorough study which was financed by the state highway department and the PRA. This engineering survey is nearly completed.

Kentucky, in July, 1947, engaged the PRA to study administration and financing of its highways. Report submitted in October outlined methods for establishing a highway classification, development of engineering standards, and estimated cost of a proposed program. A survey now authorized for purpose of developing a 6-year program.

Washington followed California's pattern; work now going on under an interim legislative committee with Automotive Safety Foundation staff members loaned to direct survey's engineering phases; $75,000 appropriated by legislature.

Oregon, like Washington, followed California's pattern and work now under way with ASF representatives loaned to direct engineering phases.

Kansas legislature in 1947 authorized an interim committee of two Senate members, two House members and 18 governor-appointed members to make an interim survey of highway needs. Twenty-five thousand dollars voted; survey to be done by autumn, 1948. ASF loaned staff to assist in engineering phases.

Nebraska legislature has directed its Legislative Council, an interim group, to cooperate with a 35-man citizens' committee appointed by governor. The personnel, many representatives of highway users groups, will study highway needs. Financed as a federal-aid highway project, the survey to be completed late in 1948 under ASF loaned staff supervision.

Colorado plans no survey but governor has requested the Highway Research Board to look into the state's highway organizational needs. Recommendations may be made for deeper studies.

Earlier Planning Efforts

Wisconsin. Recent report, "Wisconsin Highway Planning Survey—Activities and Findings, 1936-1945," is a thorough study of factors for arriving at a long-range program by state road commission.

Connecticut highway department completed a survey, "Connecticut's Road Program," in 1946. All major elements except administration examined with an eye to eventual creation of a road system which can meet any predictable future demands.

Virginia highway commission in 1947 finished survey, "20-Year Plan for the Development of Virginia Highways." Survey creates a program for paving most of state's unsurfaced roads.

Vermont finished a survey in 1940, "Needed Highway Improvements in Vermont," by highway department planning survey with PRA cooperation. Did not delve into problems of administration.

W. Virginia finished a study in 1941, "West Virginia Highways—Preservation and Development, 1940-1960." Like other earlier studies, did not go into problems connected with development of urban streets, administration and financing; survey by state road commission.

Maryland's last survey, "Maryland Highway Needs," completed in 1940, designed to create a program to 1960; did not consider thoroughly such major factors as urban streets.

The D. of C., a completely urban area insofar as highway problems go, has made a study which covers its needs, although spot and local surveys including origin-destination checks will continue to be made as needed.

States Which Plan No Action Now

Alabama contemplates no study in the immediate future, but one eventually.

Oklahoma lists no action but reports that public hearings are being held, with highway needs expressed by local groups by priority, the sug-

gested improvements to be assembled by the highway department looking to an over-all long-range program.

S. Carolina plans no immediate study as there are reported to be no "legislative" problems there at the moment calling for such a report.

Utah's plans call for no survey now although the Utah Legislative Council, an interim committee, is interested in activity for devising a program by planning.

Wyoming has no immediate plans for action. Officials there report "the necessary studies and statistical data to determine highway needs are obtained from continuing studies carried on by our planning survey."

Missouri, Nevada, N. Mexico, N. Carolina, N. Dakota and Rhode Island also indicate they plan no studies in the immediate future. **Louisiana** has not answered questionnaires.

Surveys Authorized by Legislative Mandate

Illinois. A commission is created (six House, six Senate, five citizens) to formulate a comprehensive highway program; report findings in March, 1949, to the legislature; $25,000 appropriated.

Iowa established a joint committee of citizens and members of the legislature to investigate primary and secondary road problems and related financial problems.

Maine's highway commission authorized to resume a postponed statewide planning survey to recommend financing mechanics for a program of highway improvements to 1948 legislature. Work being done by highway department with PRA cooperation.

Mass. Legislative committees on highways and motor vehicles authorized to sit during the current recess to study and recommend a program of highway and traffic improvements to the legislature by Dec., 1948. Expenses from the highway fund.

Minnesota created an interim commission (5 representatives, 5 senators) with $20,000 for a survey, results of which are to be presented to legislature mid-April, 1948. Highway department personnel assisted by the County Highway Engineers' Association and the League of Municipalities.

Miss. highway officials in '48 will outline to the legislature the need for a study. A joint legislative committee suggested to make survey.

S. Dakota legislature has named an interim committee to supervise a survey; highway department to complete by Jan., 1949. No definite sum set aside for financing. Not now an adequate staff.

Ohio legislature will probably reconsider a proposal to authorize a highway study to create a long-range plan.

Surveys Authorized by Administrative Directive

Arizona highway department is undertaking a survey reported to cover various road and street classifications as well as administration, financing, construction and maintenance. No definite sum set aside.

Arkansas commission has authorized a survey; $75,000 to be spent in six-months period.

Delaware has ordered study by Traffic Planning Division which is currently undertaking tentative surveys of all roads, but is not considering problems of administration or maintenance.

Florida conducts a survey with its own funds on a continuing basis for the use of the road department in programming future improvements.

Georgia's Division of Highway Planning to prepare a report covering state, county—secondary and urban—primary and secondary routes as well as interstate.

Idaho bureau of highways has ordered a study by planning survey, but no outline of procedure set up or budget devised. City streets omitted.

Indiana's study to be completed in August, 1948; expenditure $40,000.

Montana's Highway Planning Survey Section in cooperation with Public Roads Administration is undertaking a complete survey of every essential phase of planning work financed by state and Federal funds. A resurvey of studies going on continuously since 1936.

N. Hampshire starting a survey with PRA cooperation, 1948. Will not include an appraisal of county roads or city streets, but other major aspects will be surveyed.

New Jersey's current survey being undertaken by the Highway Department's Division of Planning and Economics covers the outlining of a comprehensive state highway system needed in the next 30 years and is nearly complete. A 10-year program calling for the expenditure of $600,000,000 has also been studied but no official action taken.

Hampered by manpower shortages, New Jersey has not included county roads or urban streets in its survey.

New York D. of P. W. has ordered a survey; will not, however, investigate county road or maintenance needs. No deadline set or fixed fund appropriated.

Tennessee plans a complete survey of each major phase of its highway system.

Texas is now completing an examination of its state roads and a partial survey of county roads and city streets. Ordered by the highway commission; staffed by department personnel; designed to develop an estimate of the state's large highway system.

A Summary

A round-up of the states shows, then, that 9 surveys are in progress or complete; 6, plus D.C., have made earlier efforts, 12 plan no action, 8 are now authorized by legislatures and 13 by administrative directive.

There appears to be developing a new high degree of interest and enthusiasm as states step up the tempo of their search for a solution to the long-range highway problem. Technical standards of surveys may vary in the different states, but it is apparent that a new awareness of the importance of finding an answer to the problem is everywhere.

Just so long as this enthusiasm and interest is sustained, and they must be if our roads are to catch up with the demands on them, there seems good reason to hope that all the states will eventually tackle the problem with studies patterned on the best techniques yet devised.

Large Dam Contract to Be Let

On or about Jan. 29, the Kansas City District, Corps of Engineers, Kansas City, Mo., was scheduled to receive bids for the completion of Harlan County Dam, on the Republican River, about 8 miles east of Alma, Neb., and about 75 miles southeast of McCook, Neb. Contract period is 1,400 calendar days. Principal quantities include: 10,497,000 cu. yd. borrow excavation; 309,000 cu. yd. chalk excavation; 8,467,500 cu. yd. impervious fill; 987,000 cu. yd. pervious fill; 1,175,000 cu. yd. berm fill; 180,000 cu. yd. riprap; 341,000 cu yd. mass concrete in dam; 465,000 bbl. Portland cement, and 750,000 lb. structural steel.

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State Highway Department Buys Steel—At its December session the State Highway Commission of Oklahoma opened bids for furnishing 3,200,500 lb. of steel for bridges. The commission closed contracts for the steel at **a price of $316,376.** The engineer's estimated cost was $327,359. Acquiring steel on state purchase and providing the material to contractors on a bid basis for erection was adopted by the commission as an experiment in an effort to hammer down costs.

How To Select and Use

Dragline Buckets

By Page Engineering Company
Chicago, Ill.

THE efficiency of a dragline depends as much upon its bucket as upon any other factor. Whether it's a walking dragline, or a truck or crawler mounted rig converted to dragline operation, the entire machine is devoted to one function: the operation of a bucket.

Selection

The dragline and its bucket are a team—they must be mated properly in order to get the proper action and greatest efficiency. Every pass with the wrong bucket costs money.

How to determine correct size bucket to use.—All dragline manufacturers have a capacity and lifting chart under which a dragline is sold and guaranteed.

The weights of ⅜, ½ and ¾ cu. yd. draglines vary among manufacturers so some have come to be considered light and others heavy.

Since the working range and lifting capacities vary, the charts should always be consulted to determine the correct size of bucket for the best results.

By using the following formula you will be assured of equipping your dragline with the correct size.

Cubic foot capacity of bucket, times weight of material per cubic foot, plus weight of bucket, equals total load of bucket and material, for comparison with machine lifting capacity rating at the angle at which the boom will be worked.

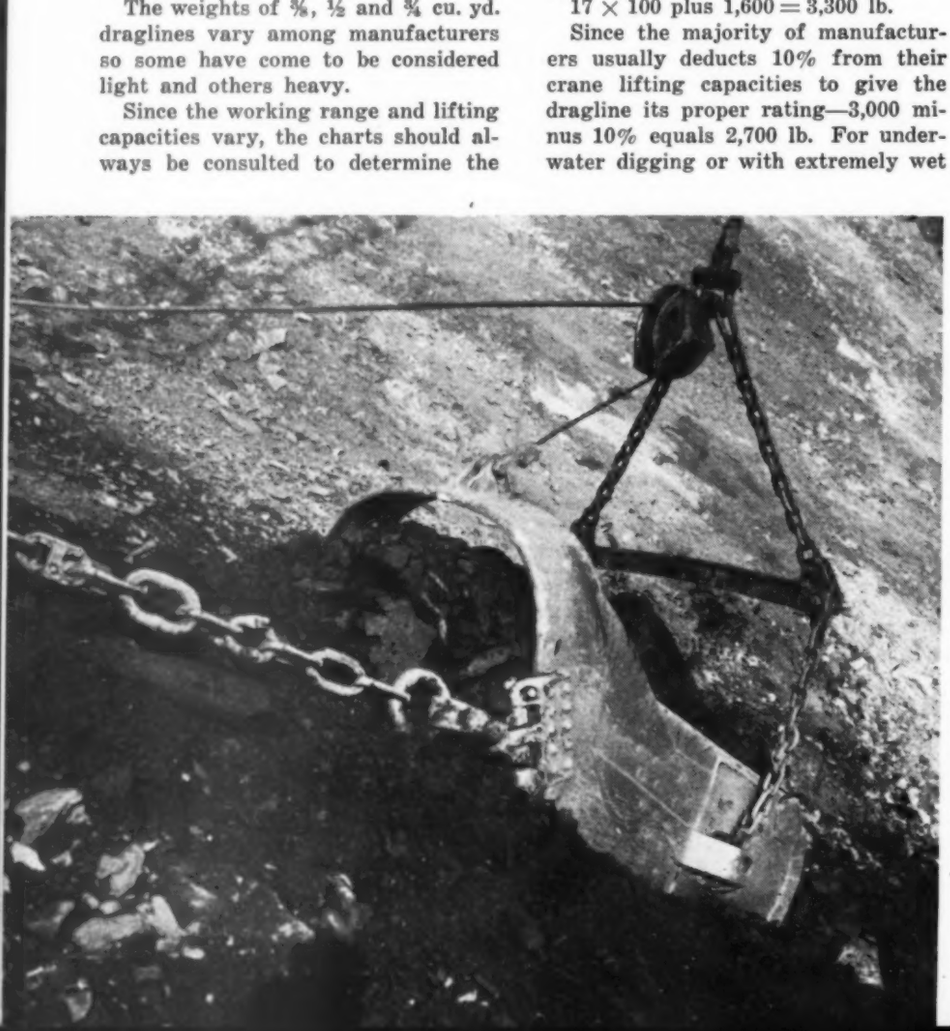
Always use the formula regardless of size of machine. For example: a dragline with a total weight of 28,000 lb. is considered a light ½ cu. yd. dragline. Lifting capacity 2,800 to 3,000 lb. with a 30 ft. boom operating with a 30 ft. radius. A ½ yd. Page "Automatic" bucket has a capacity of 17 cu. ft. and weighs 1,600 lb. Class 2 material, like clay, weighs 100 lb. per cu. ft. Applying the formula

17×100 plus $1{,}600 = 3{,}300$ lb.

Since the majority of manufacturers usually deducts 10% from their crane lifting capacities to give the dragline its proper rating—3,000 minus 10% equals 2,700 lb. For underwater digging or with extremely wet material deduct another 10%. This being the case, a 17 cu. ft. bucket would overload the dragline. A 14 cu. ft. bucket would be the proper size.

14×100 plus $1{,}100 = 2{,}500$ lb.

This 2,500 lb. over-all weight of bucket and load will be on the safe side. The dragline will operate more efficiently, require fewer repairs, produce more yardage at lower cost.



Don't Overload the Dragline

The manufacturer of your dragline designed and built into it a definite capacity to handle a given size of bucket. The line speeds, line pull and swing speed have been synchronized. The mechanism has been engineered for certain loads. Follow the capacity chart supplied with the machine and it will work profitably for you. Overload it and you'll lose far more time and money in the long run than you can possibly gain with an oversize bucket.

Don't Underload — Be Sure the Bucket Will Handle All It's Rated for

While it is foolish and costly to overload a dragline, you also lose heavily if you fail to use it up to its rated capacity. Underloading is caused by using a bucket that won't actually handle as much material as its capacity rating indicates.

Most ordinary buckets base their rated capacity on the approximate physical size of the bucket, forgetting to make an allowance for the curved portions and the open end of the bucket. These allowances *must* be taken into consideration before the bucket can be truthfully rated as to its capacity.

Use

Quick loading and immediate hoisting are the keys to big yardage. The more nearly the cycle of operation approaches that of a grab bucket, the better the yardage will be. By picking up the bucket with its load as nearly under the boom point as possible, the shorter the digging cycle will be. By properly managing the

usual excavation, 80% of the work can be done at this point resulting in the most efficient operation. Even if some of the load is lost by early pick-up, better yardage will be secured over a method of pulling the bucket much farther to secure a more perfect pick-up. Many operators get into the bad habit of pulling the bucket a greater distance than is necessary, thus wearing out the bucket and cables unnecessarily.

Any bucket should fill when being pulled uphill, but not all of them will dig on a level cut. The bucket which digs on a level cut, will permit a well-shaped pit and give the digging advantage of lengthwise pulls in seamy material. This is an advantage under many conditions such as the saving of topsoil, excavating a seam of coal, gypsum, fuller's earth, certain types of clay, etc., where contamination from other layers must be prevented. Another point is that materials dig easier when horizontal layers are followed.

With old-style and old model buckets it is necessary to snag the teeth, even hoisting the back end of the bucket to get the teeth started digging. They sometimes actually go through the operations of three tools —scarifying, bulldozing, and scraping.

Lower Bucket with All Lines Taut

When the bucket is returned to the pit, the load line should be tightened to right the bucket while swinging for a new load. The slight pull necessary will put the bucket only slightly forward from under the point of the boom. The bucket should come down into the pit with all lines taut. The load line should be started forward immediately as soon as the weight is off the hoist line. Keep the hoist line slackened so that all the weight of the bucket is available for digging action. The habit of bringing the bucket into the pit with the bucket righted should be acquired. It produces the best results both as to yardage and to smooth, fast operation.

Keep the Bucket Clean

Allowing sticky mud to accumulate in the back of a bucket will change the digging action to such an extent that the yardage will be greatly reduced. Many users fasten pieces of chain in the inside back of the bucket to facilitate the dumping of sticky material.

Correct Fittings or Riggings Essential

The riggings or fittings of a bucket must be right for proper clearance, balance and control. Good performance requires bales of correct length as equipped at the factory with standard fittings. With correct length bales, there is no worry about the bucket's rubbing against the chains. The dump rope length determines the angle at which the bucket carries. The dump rope should be long enough to permit only a slight sag in the load chains when carrying a load.

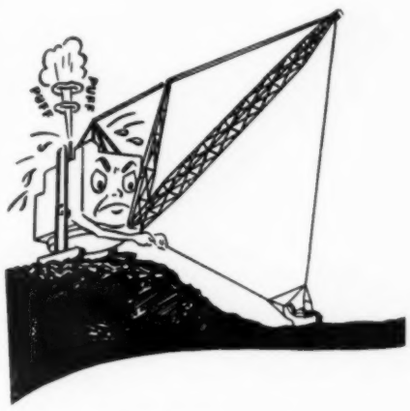
Keep the Teeth Sharp

The teeth of a bucket start the digging and, therefore, get the most punishment. They must be sharp at the cutting edge and tight on their bases to secure best results. Tooth points are easily replaced or may be sharpened numerous times by welding on new tips or building up worn edges and grinding into shape. Special hardfacing metal is often welded along the edges of digging teeth on the top side to prolong their digging lives. Never operate your bucket without all teeth being solidly in place. Slender, sharp teeth are necessary but the extending or lengthening of the tooth points will generally result in breaking the tooth stubs without, as a rule, improving the digging action. Since all relationships in a bucket are designed about the point of the tooth, lengthening of these units throws all of the "built-in" digging qualities out of balance. Only under the most unusual conditions will you get extra yardage by adding teeth.

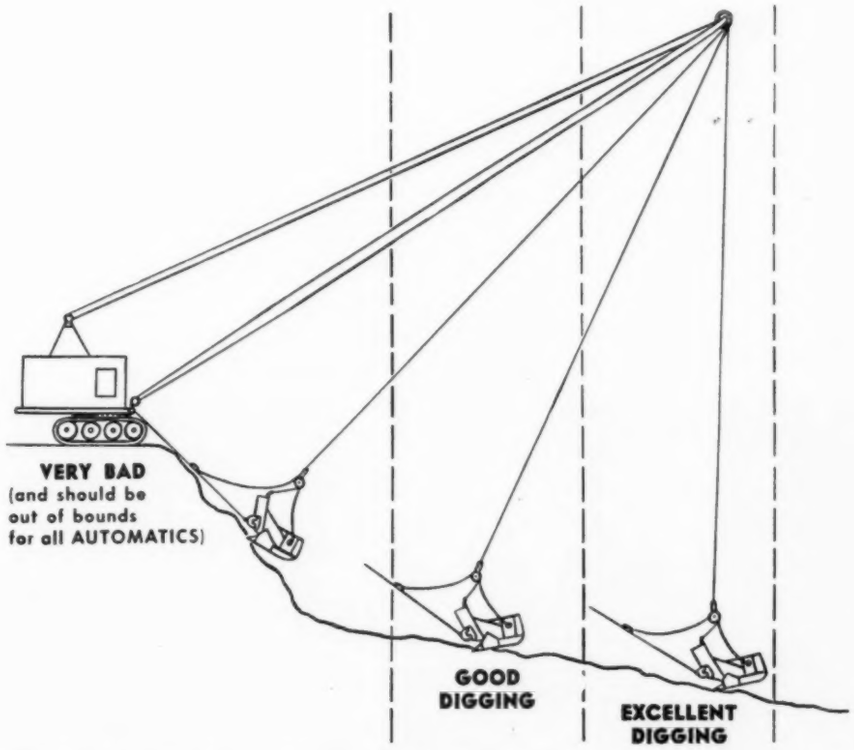
Some good digging practices.—(a) Dig as nearly under the boom point as possible; (b) Pick up the bucket as soon as it is loaded; (c) Dig in layers, not ditches; (d) Move back and cut off top edge of bank that might wear out your drag rope; (e) Dig high wall directly in front of machine, not off at an angle; (f) Be sure the bucket will handle all that it is rated for; (g) Use the right bucket for the job; (h) Keep a good level track for your machine; (i) Lower bucket with all lines taut; (j) Keep the bucket clean; (k) Do not throw the bucket around or bang it up.

Don't Bang the Bucket

When the boom is in motion the bucket is lagging behind but do not



★ Don't overload your dragline



★ Diagram illustrating digging conditions for dragline buckets

drop the bucket to stop the swinging of the machine. If the bucket is dropped continually in returning to the pit, especially if it is swinging, it will strike on one or the other of the forward hitch plates. Often the hitch plates are bent inward giving the impression that the bucket has been pulled together by the load chains. The arch is sometimes bent downward on its crown but this is also due to the dropping of the bucket particularly when it is being thrown to get the material beyond the point of the boom. This latter operation is an expedient that can be very useful but should be attempted only by a very skilled operator. Unless the bucket is properly checked by means of the brakes, the arch will surely be bent or broken.

Swinging the bucket into a bank to knock out sticky mud is another cause of a great many bucket failures. A few operators unloading in bins, trucks or banks will drop the bucket against the sides thereby damaging both the hauling unit and the sides of the bucket.

Do not get into the habit of dropping the bucket in a heap because the cables and chains may become tangled and considerable time will be lost on each bucket load.

Seldom, if ever, are buckets broken by the digging operations. They are most always broken by some of the actions discussed above. Wise owners and operators know all these things and also that proper operating methods produce real yardage.

Cold Weather Operation

Operators who dig in extremely cold weather should take particular precaution to prevent cracking the bucket. It is recommended that before digging, warm your bucket slightly with a fuel oil fire.

Care of the Lip

Protection of the corners of the lip is essential in order to prevent wearing away the metal and the weakening of the lip.

Pins and links should be replaced before they are worn through, as it saves time to do this when convenient rather than stopping for repair when working. It is good economy to have spare parts for your bucket on hand.

Lip Shrouds

Most heavy-duty buckets are equipped with lip shrouds to prevent wearing of the lip. If your bucket is not and you intend to do heavy digging, it is wise to use lip shrouds and be certain of less lip wear. Lip shrouds are available upon request and may be easily welded onto the lip.

Contractors, Superintendents and Foremen Hold Safety Meeting

More than 225 men attended the fall superintendents' and foremen's dinner meeting on accident prevention of the Constructors' Association of Western Pennsylvania at the Roosevelt Hotel, Nov. 14.

The Constructors' Association, an organization of the leading heavy engineering, railroad contracting and highway construction contractors, has taken an active interest in reducing the accidents on the members' construction projects since shortly after its founding.

Accident Prevention work for contractor's associations was pioneered by the Constructors' Association of Western Pennsylvania and, as far as is known, there is still no such similar work on so large a scale anywhere else in the country.

Because of an early recognition of the importance of the superintendent and foremen—the men directly supervising the workmen—in the prevention of accidents, and some later intensive effort in arousing interest and accident prevention awareness among these men, the Association has been able to achieve some spectacular results.

From a high of $7 in 1936, the Pennsylvania Workmen's Compensation Manual Rate for "Roads and Streets" classification has dropped to its present $2.25 per $100 of payroll. Other heavy construction classifications have shown a similar decline and, although the work of the Association is not altogether responsible for this record, there is no doubt but that its efforts have aided materially.

Moreover, attendance at the semi-annual meetings has jumped from 19 in 1938 to the record of 225 just established.

A feature of the November 14 meeting was a "What's—wrong—here" cartoon contest in which those who attended marked the hazards to be found in a drawing which had been previously sent them. The winner, Thomas Stewart of the Jay C. Speaker firm, found 212 hazardous situations depicted. Second and third prizes went to Ted Deklewa of the Harrison Construction Company and Philip A. Fay of the McCrady Construction Company, respectively.

"What's Wrong" Cartoons

Prizes included an electric razor, a $10 hat and a Luftkin steel tape.

Also highlighting the program was a series of well-acted sketches showing the value of careful planning of equipment and machine placing in preventing accidents. Otto S. Holmskog, Senior Construction Engineering, Employers Mutual Liability Insurance Company, played the prominent part. F. D. Webb and Joseph E. Jackman assisted him.

G. O. Griffin of the Dravo Corporation gave an illustrated demonstration of the value and use of the "Safety-graph." This is a large set of drawings and pictures showing the correct methods and operations which should be used to avoid various hazardous situations. An explanation of the material which is visible to the audience appears on the other side so that even an unpracticed demonstrator may make a good presentation. The "Safety-graph" is prepared and distributed by the National Safety Council.

Rounding out the program were short addresses by J. E. O'Leary, Chairman of the Association's Public Relations Committee on "Accident Prevention is good Public Relations" and George B. Larson of the American Cancer Society talked briefly about the prevention of cancer.

Roy A. MacGregor is Executive Secretary of the Constructors' Association and D. Dinardo is Chairman of the Accident Prevention Committee.

★ Foremen and superintendents at safety meeting
(Photo courtesy Pennsylvania Construction Digest)

Fineness Modulus Worthy of Wider Use

By Stanton Walker
Director of Engineering, National Sand and Gravel Association, Washington 4, D. C.

From "odds and ends," Technical Letter No. 52, issued by the National Sand and Gravel Association.

The fineness modulus is a measure of the grading of granular materials. Its application has been almost entirely to mineral aggregates. It was developed by D. A. Abrams in about 1917. It is a most helpful tool in the design of concrete mixtures but it has not been used for that purpose to the extent justified by its value. A principal and common use of the function in recent years has been as a measure of the uniformity of grading of fine aggregate.

For example, the "Guide Specifications for Concrete Construction for Civil Works" of the War Department dated 1946 read as follows:

"In addition to the grading limits shown above, the fine aggregate, as delivered to the mixer, shall have a fineness modulus of not less than 2.40 or more than 2.90 and, during normal operations, the grading of the fine aggregate shall be controlled so that the fineness moduli of at least nine of ten test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.10 from the average fineness modulus."

Unless more than the usual one size of sand is used, considerable difficulty will be encountered in maintaining the grading within the narrow limits indicated by ±0.10 in fineness modulus. As a matter of fact, arbitrary and rigid enforcement of the clause might make, in many cases, the requirement impracticable of application.

The American Society for Testing Materials, in its Standard Specifications for Concrete Aggregates (C 33), also makes use of the fineness modulus as a measure of uniformity of fine aggregates. It provides:

"Fine aggregate from any one source having a variation in fineness modulus greater than plus or minus 0.20 from the fineness modulus of the representative sample submitted by the contractor shall either be rejected or may be accepted subject to such adjustment in proportions as may be necessary by reason of changes in grading of fine aggregate."

For materials coarser than the No. 200 sieve, the fineness modulus can be calculated most conveniently by adding the total percentages retained on each of a specified series of sieves and dividing by 100. The sieves used are No. 100 (149 micron), No. 50 (297 micron), No. 30 (590 micron), No. 16 (1190 micron), No. 8 (2380 micron), No. 4 (4760 micron), ⅜ in., ¾ in. 1½ in., and larger, increasing in the ratio of 2 to 1. The following gives examples of typical sieve analyses of fine and coarse aggregate and of the calculation of the fineness modulus.

Sieve No. or Size	Percents Retained on Each Sieve	
	Sand	Gravel
100	98	100
50	85	100
30	60	100
16	37	100
8	12	98
4	2	95
⅜ in.	0	75
¾ in.	0	40
1½ in.	0	0
	2.94	7.08

For most practical applications the preceding method of calculating fineness modulus is adequate, but it should not be overlooked that the fineness modulus is in fact, a mathematical function of the logarithm of the diameter of the particle. For the conditions established, which require material coarser than a No. 200 sieve and finer than a No. 100 sieve to have a fineness modulus of zero, the mathematical relationship may be stated as follows:

$$m = 7.94 + 3.32 \log d$$

where, m = fineness modulus
d = diameter of particle in inches

The use of this concept permits of computing the fineness modulus of material of any size including that finer than a No. 200 sieve. For example, the fineness modulus of cement may be computed and it will be found to have a negative value. For the average cement it is sufficiently accurate to assume the fineness modulus to be —2.5. The application of the fineness modulus of cement to the design of concrete mixtures has been discussed briefly in a publication of the National Ready Mixed Concrete Association on "Control of Quality of Ready Mixed Concrete" first issued in July, 1944. A further discussion of this application is expected to appear in a Journal of the American Concrete Institute some time during the present year. Additional material on the use of the fineness modulus will be included in future Technical Information Letters.

Mail Inserted Card or Inquiry Blank (page 132) for Equipment Data

Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 117, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 132 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

Lime Used in Airfield Base

(*Continued from page* 96)

flexible base was 7 to 8 inches, a somewhat low figure for such a poor subgrade.

In 1944 the bearing capacity of the asphalt surfaced pavement was measured by actual loading tests. This indicated a safe maximum wheel load of 17,000 to 40,000 lb., depending on tire pressure, the lower values corresponding to the relatively higher tire pressures and vice versa. The plate loading or bearing tests were made on the pavement surface. Again considering the poor quality of the subgrade, these facts are unusual. On further testing, the caliche base course has relatively good stability and bearing value.

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Contracts Less than Estimates—At the December session the state highway commission of Oklahoma awarded more than $2,200,000 in contracts that figured 10% less than estimates. One hundred and fifty-six bids, a 2-year all-time high, were received on 45 projects.

Contractor-Highway Committee

Recommends Long Range Highway Program Legislation at Miami Meeting

LEGISLATION assuring a minimum of $500,000,000 a year in federal appropriations for many years to come is essential to the most efficient and economical construction of the nation's highway system, Robert H. Baldock, Oregon, president, American Association of State Highway Officials, stated at Miami.

Addressing a meeting of the Joint Cooperative Committee, AASHO-AGC, there on Dec. 7, Mr. Baldock said that if the tremendous program of highway construction which is necessary to catch up with traffic demands is to be met in the most efficient and economical manner, the state highway departments and highway contractors need assurance of continuing federal appropriations of this magnitude. State highway departments need the assurance of continuing appropriations so that they can draft the long-range plans which make for most economical construction, and so that they can develop their engineering and other forces to handle this volume of planning and administration.

Highway contractors need the assurance of continuing appropriations so that they also can develop organizations which can carry out the work with the maximum of speed, efficiency and economy.

State legislatures need this assurance of a long-range highway construction program so that they can properly plan their matching appropriations, and plan their tax programs to assure adequate state funds.

Mr. Baldock pointed out to the meeting, which was held prior to the meeting of the Southeastern Association of State Highway Officials, that collections from the present 1.5 cent federal gasoline tax would be ample to provide for the federal appropriation.

He emphasized that legislation assuring a long-range construction program, and close cooperation between highway officials and highway contractors to further their common objective of building better highways for less money, were essential to most efficient and economical highway construction.

C. W. Phillips, Commissioner of the Tennessee Highway Department, and immediate past president of the American Association of State Highway Officials, said that never before had there been need for a long-range highway construction program, or the need for more concerted effort to secure it.

He stated that meetings between highway engineers and contractors through the Joint Cooperative Committee or otherwise were the best way to solve mutual problems, and unite for coordinated efforts to secure necessary legislation.

The Joint Cooperative Committee adopted a resolution endorsing federal legislation to enable planning of long-range highway construction programs by the states. (Full text of the resolution, and others, is attached.)

Purpose of Committee

Purposes of the Joint Cooperative Committee were explained by the co-chairman, W. Vance Baise, chief engineer, North Carolina State Highway and Public Works Commission, representing the American Association of State Highway Officials; and Morris E. DeWitt, Kirkwood, Missouri, of the Porter-DeWitt Construction Co., representing the Associated General Contractors of America.

They described how meetings of the committee enable highway officials and highway contractors to know each other better, to develop better relations with each other, to learn more of the other's problems, and to join in solving mutual problems so that money is saved for the taxpayer.

Items on the agenda, the principal points discussed and conclusions reached were as follows:

To Eliminate Uncertainties

There was general agreement that all possible improvements should be made in specifications and design to eliminate uncertainties, and that the more information a contractor had the better his bid would be. Suggestions which were made, or experiences which were cited as helpful included:

Specify results, not methods.

Reduce possibilities for scope of work to be changed.

Secondary Road Construction

With respect to fitting specifications to local conditions to reduce cost and engineering supervision on secondary roads, discussions centered on such points as eliminating grading to string lines, hand rubbing of structural concrete, hand finishing of back slopes; of allowing greater tolerances in grade and alignment, decreasing the compaction requirement to 90%; and the question of whether or not work should be bid by the mile.

Emphasis was given many times in the discussion that engineers and contractors not only find it mutually helpful to cooperate on their problems, but they have the responsibility to do so.

It was pointed out also that in addition to the need for cooperation between the state highway departments and organizations of contractors, both the departments and the contractors have the responsibility of educating their field representatives on the questions which have been settled.

Cooperation has been demonstrated as helpful not only between the department and contractors in a state, but also between the contractors and states in a region.

Contractors suggested the desirability for quicker decisions and inspections. Departments noted that shortages of engineers generally was responsible for delays.

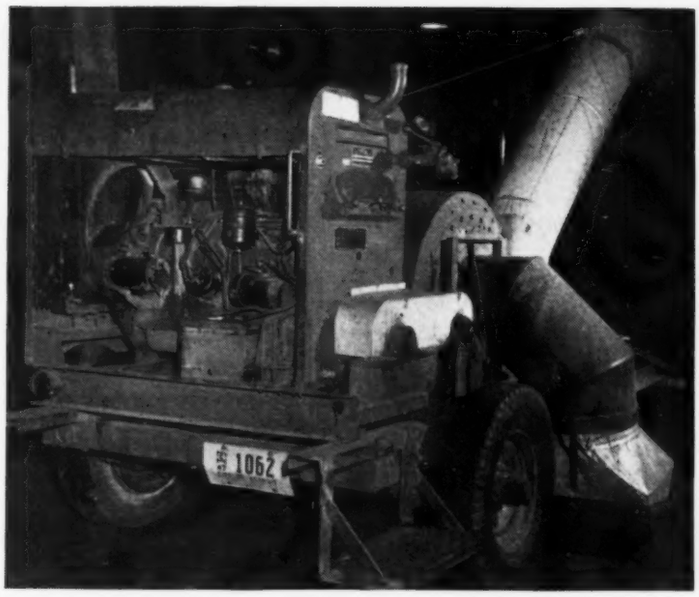
State highway departments meet jointly with chapters of The Associated General Contractors of America to review specifications and design.

Make specifications as definite as possible, make plans as complete as possible, make quantities as definite as possible so contractors can estimate closely.

Locate and indicate soil and borrow pits to be used.

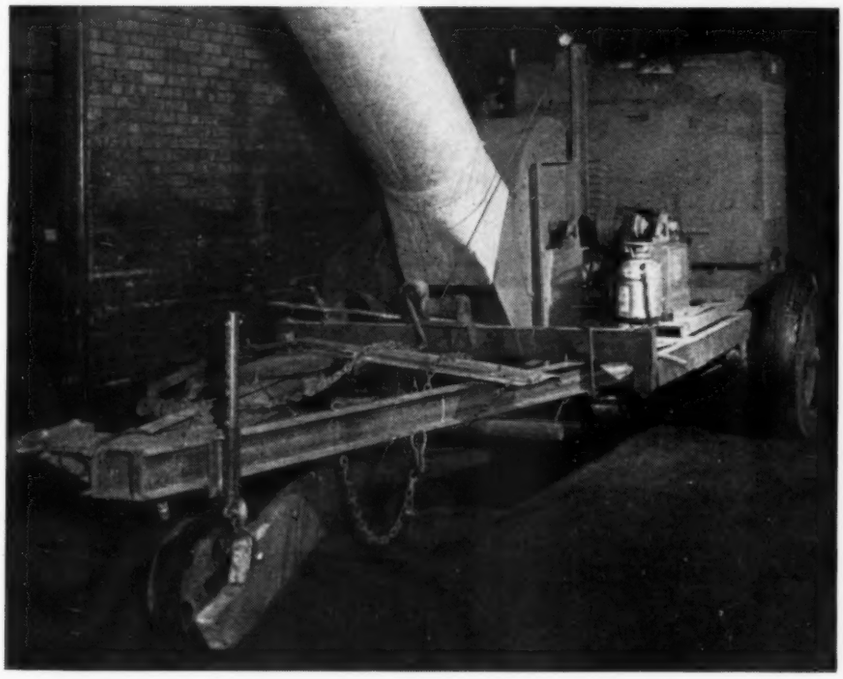
Hold meetings of state engineers so that more uniform interpretation

(*Continued on page* 114)



Another Leaf Loader

Recently Detroit's streets were also the beneficiary of a mechanical leaf loading machine (See Nov. '47 R&S for a machine built by the Birmingham d. of p.w. staff). Here the outfit is at work. According to Superintendent Glenn C. Richards of the Detroit department of public works, it is the result of an idea which has simmered for several years. Frank Stang, associate mechanical engineer with the city division of sanitation, points out that "the principle involved is similar to that of the vacuum sweeper commonly used in the home, with variations to accommodate the difference in volume and type of material being picked up. The unit is designed to attach to the back of the truck and the fan outlet pipe elevated to enter the truck above the tailgate. The top of the truck is covered with medium close woven burlap to trap the dust and leaves delivered by the fan."



As now assembled the unit has a gasoline motor mounted at the rear with the suction fan directly ahead. The pictures show clearly the arrangement of intake and outlet ducts.

A wiper board is suspended diagonally across the machine with the lower edge in contact with the pavement. This board moves the leaves toward the curb and increases the cleaning width to 5 or 6 ft.

To overcome the problem of occasional plugging of the intake when a large volume of leaves enter at one time, an agitator has been installed. This consists of a shaft equipped with a series of fingers to break up the piles of leaves as they enter the throat.

The machine in its present form may be described as crude, notes Mr. Stang, and this appearance is not helped by the exaggerated length of the forward end in the two front angle shots. The results are worth more than the appearance in this case since we have been able to get loads of 4,000 to 5,000 lb. in a 10-yd. truck body.

Superintendent Richards, like many other city officials, is watching with interest the development of commercially manufactured loaders, several makes of which are now on the market or being contemplated.

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Modern practices in public works planning and construction, with special emphasis on highways, will be brought to the attention of engineering college students through a series of lectures now being scheduled by the New York State Department of Public Works. The first talk was given at Cooper Union in New York City, December 8, when Francis L. Brown, executive assistant of the Department, and Fred W. Fisch, director of its bureau of arterial route planning, addressed a meeting of the ASCE student chapter.

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Gasoline consumption rose 11.2% first half 1947 compared with same period 1946 according to an ARBA bulletin. The 1946 total mileage clocked by motor vehicles in the U.S. was estimated at 340 billion vehicle-miles.

California's Latest Results and Experiments in Asphalt Subsealing

Outlining new efficient methods which have increased the output and cut costs on this type of work. Appearing in Sept.-Oct., 1946, "California Highways and Public Works," this article supplements an article in the May-June issue of that publication

By H. L. Cooper and W. R. Severing

California Division of Highways

OBSERVATIONS and experiments made since asphalt subsealing work started in March, 1946, give promise that the use of hot liquid asphalt pumped under concrete pavements in order to reduce slab movement and eliminate the pumping condition and also seal the pavement from the bottom side will prove a sound and worthwhile procedure.

It has been possible to speed up the subsealing work by the use of two 900-gal. asphalt heating tanks which were converted from 1,040-gal. water tanks by the headquarters shop. These tanks are complete with burners, oil pumps, and pressure hose and are capable of heating cold packaged asphalt to 450 deg. F. and of pumping directly under the pavement.

Since work started this year, District X has drilled and pumped 15,900 holes using 541 tons asphalt, or an average of 8.0 gal. at a cost of $2.15 per hole.

District IV, by hauling hot asphalt directly from a bay area refinery, was able to average 188 holes per day on one job. Twelve gallons of asphalt were pumped per hole at a cost of $2.35 per hole.

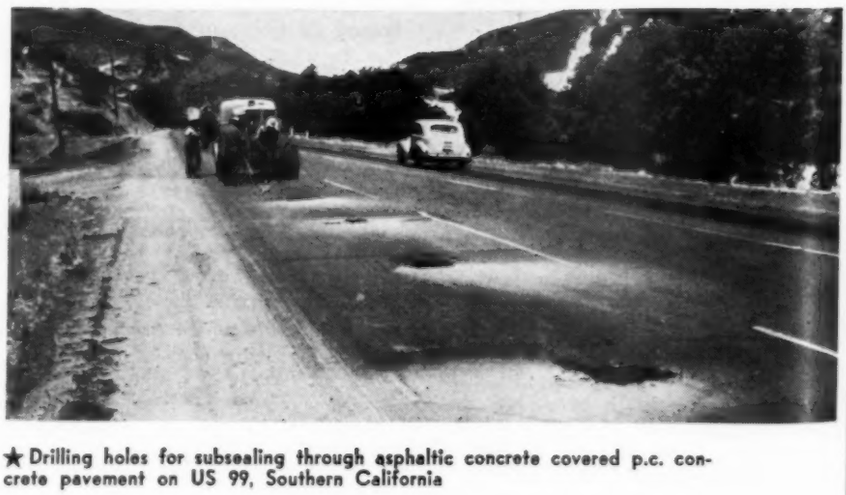
This past season's subsealing work has been completed in Districts II, III, V, VI, and XI where the hand-operated asphalt heating kettles of 165- to 400-gal. capacities were used. The equipment used and conditions encountered were reflected in the variation in unit cost of the work which averaged from $2.60 to $4.00 per hole.

In order to improve the asphalt subsealing procedure and to standardize equipment for this work certain observations, measurements and experiments were made in several districts with the help of the headquarters laboratory.

Measurements of the temperature of asphalt after injection beneath the pavement and the movement of the concrete slabs, both during subsealing and under loaded trucks were made and the following conclusions drawn:

1. The asphalt, after being injected, will cool to subgrade temperature in from 15 min. to 1 hr., depending on the thickness of the asphalt layer.

2. Free water under the pavement may chill the asphalt too quickly to permit satisfactory distribution. Additional temperature measurements should be made to secure more data on this phase.



★ Drilling holes for subsealing through asphaltic concrete covered p.c. concrete pavement on US 99, Southern California

3. The asphalt may be forced into any void beneath the pavement except when free water is present.

4. A lift of 0.05 in. to 0.10 in. should be given to all slabs, and lifts up to ½ in. may be given if slabs are low.

In the first subsealing work no attempt was made to raise the slab, the object being to force only sufficient asphalt under the slab to fill cavities and to provide a membrane that would seal off the subgrade and prevent further loss of subgrade material through the cracks in the concrete pavement.

The slabs should in all cases be given a lift of from 0.05 in. to 0.1 in. to assure that contraction of the asphalt on cooling will not leave the slab unsupported.

It is not possible by this method to raise slabs which are completely in contact with the subgrade. With the 40 lb. per sq. in. pressure normally used, it is necessary for the asphalt to spread over an area of approximately 3 sq. ft. before sufficient hydraulic pressure is exerted to lift a 20 by 11 ft. slab.

5. The deflections of slabs under loads are materially reduced by asphalt subsealing. An example is given where the slab deflection was reduced 60 % 24 hrs. after being subsealed.

During 1944 and 1945, 40-50 and 30-40 penetration asphalt was used. It was found that some extrusions took place due to the fact the asphalt apparently was too soft.

This year asphalt of 20-30 penetration was used in all subsealing work to partially overcome this difficulty. However, in many cases, especially in parts of the State where air temperatures are high, small extrusions still take place where the drill holes have not been filled with cement grout or with wooden plugs. Possibly a slightly lower penetration asphalt should be used in the future for this type of work.

Pilot Study of Heavy Motor Vehicle Operation

The Highway Research Board today announced plans for an early study of the operation of heavy motor vehicles on highways traversing the mountainous section of southwestern Pennsylvania. The proposed series of tests, referred to as the Pilot Study, is designed to establish the performance characteristics of various types of heavy trucks and combinations. The study constitutes the initial phase of a planned research program of the Board's Committee on Economics of Motor Vehicle Size and Weight in the Department of Economics, Finance and Administration.

In its several phases, the planned research program of the Committee is designed to establish the ultimate economy of highway transportation, considering both the cost of heavy motor vehicle operation and the cost of road provision at design standards and capacities necessary to accommodate the various levels of size and weight under investigation.

The test vehicles selected for the first phase of the investigation, the Pilot Study, consisted of two trucks, three truck-tractor, semi-trailer combinations, a truck and full trailer combination, and a double combination of truck-tractor, semi-trailer and trailer. The several vehicles will provide a progressive number of heavy load axles ranging from one in the smallest single truck to six in the largest combination. Each of the test vehicles will be variously loaded and operated with a series of uniform axle loads having 14,000, 18,000 and 22,000 pounds on the load axles to encompass the range of axle loads presently permitted in the various states. The carefully controlled conditions of axle loading, to be obtained by the use of precast-concrete blocks, will provide a range of gross vehicle weights extending from 20,000 to 142,000 pounds.

The selection of stock models of powered units is based upon the requirement that the test vehicles be powered as nearly as practicable in proportion to the gross vehicle or gross train weight when loaded for the 18,000-lb., axle-load series. The operation of the test vehicles with varied axle loadings will therefore produce considerable overlapping of gross vehicle weights between vehicles of different type, affording comparison of the performance ability of vehicles with similar gross weights but with different power ratios.

The dimensions of the test vehicles and combinations will be appropriate to their loading and practical axle spacings and the operation beyond statutory limits of size and weight will be cleared by special permit.

The routes selected for the operation of the test vehicles, scheduled to begin in the late spring of 1948, are the Pennsylvania Turnpike and U. S. 30 and 11, through Chambersburg, having common termini at Middlesex and Irwin. At least three round trips will be made by each test vehicle over each route, profile maps of which have been prepared to permit of recording operation variables on sections characterized by significant changes in gradient and curvature. The considerable contrast in the lengths and percents of gradient on the two routes and in the two directions will provide a variety of operating conditions affecting heavy vehicle performance.

The preliminary program governing the operation of the test vehicles has been drawn up. The operation schedule calls for the use of six drivers in two daily shifts and provides for the inter-change of drivers between the test vehicles and staggered operation in shifts. Upon completion of the test runs for the number one, two-axle truck, that vehicle will be operated as a control vehicle for each of the remaining runs to provide a measure of the effect of changed conditions on the operation of the other test vehicles. It is expected that the entire series of tests will require about two months for completion.

An observer will accompany each vehicle on each run, making record of weather and its effect on road conditions, maintaining a time log by route sections, and recording gasoline consumption by route sections and by mileage using specially constructed fuel-meters to be inserted in the fuel line of each vehicle. Wheel revolutions will be recorded by route sections for calculation of wheel slippage. Traffic surveys will be made and turnpike toll counts will be obtained throughout the study at points of significant change on both routes. Speed distribution studies of traffic at various points along the routes will be independently conducted and record will be made of the number and time of passing of vehicles passing the test vehicle in the same direction. Driver manhours and the direct costs of fuel, oil and grease will be recorded.

Arrangements are to be made for the sharing of the expense of the tests, including the provision of test vehicles, drivers, observers, fuel, etc., by the various sponsoring organizations representative of the producers and operators of commercial motor vehicles, and highway officials of the State and Federal governments. The following organizations are included:

American Association of State Highway Officials.

American Trucking Associations, Inc.

Motor Truck Division, Automobile Manufacturers Association.

National Association of Motor Bus Operators.

National Council of Private Motor Truck Owners, Inc.

National Highway Users Conference.

Pennsylvania Highway Department.

Pennsylvania Turnpike Commission.

Public Roads Administration.

Society of Automotive Engineers.

Truck Trailer Manufacturers Association.

How to Appraise Housing for

Condemnation

The Connecticut state highway department's rights-of-way division bases its appraisal methods on research done in relation to cost and volume of housing space involved, according to a description published in the department's monthly bulletin

LONG standing methods and practices for estimating the fair market price of houses and other buildings have been retired by the division in favor of a new uniform and apparently more accurate procedure. In spite of the fact that the value of houses is deemed to be a very elusive and uncertain quantity, the new approach "nails it down" with reasonable exactness and dispatch.

The uncertainty of all forms of valuation arises from the economic theory that price measures the combined effect of scarcity and desirability. Thus, while the air which we breathe is of paramount desirability, it commands no price because there is no scarcity.

In estimating the value of property, therefore, an appraiser is, in effect, attempting to measure desirability in terms of dollars; a quantity which exists only in the mind. Until recently there had been no "yard stick" or formulated rule that would measure this quantity. The new plan uses a few basic rules which are calculated to give an approximate answer to the problem. It assumes that no one will, in reasonable probability, pay more for a used article or house than it would cost to buy or build the same article or house, new. Another basic fact is using the knowledge of what people have done to procure a fair measure of their thoughts. This is taken as the surest path to a knowledge of what they will think and do.

On this basis, it was decided, first to find the cost of duplicating any structure, and, second, what proportion of the new cost should be paid for houses in various stages of age and deterioration.

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Estimating Reproduction Cost

The most accurate accepted method of estimating the new cost of a house, the quantity survey method, is to measure it board by board and brick by brick; get cost prices of materials going into the structure; get labor and other related costs. This procedure is slow, tedious and expensive and moreover requires a high degree of knowledge and skill. The new procedure now being used by the rights of way division has short-cut the older methods and appears to be a possible answer to the appraiser's dream.

In estimating the replacement cost of structures the obvious short cut is to use the volume times the cubic-foot cost. This method is not new. Previously, however, the unit cost per foot has been based upon the experience of the appraiser and has generally resulted in figures being used that furthered the interests the appraiser was serving rather than giving rational results.

Considering the elements which control costs per cubic foot, it appears that these costs should vary with the quantity and quality of the structure. That it should vary with the quality is apparent but its variance with the quantity may not be equally apparent.

To illustrate, the cost of a cubical box is dependant on its surface area, not its contents. If we assume a cost of one cent per square foot of surface area, then a one foot cube having six square feet of surface area would cost six cents. A cube, 2 feet on a side, containing 8 cubic feet, has a surface area of 24 square feet. Under the same assumption of one cent per square foot this cube would cost 24 cents, a rate of 3 cents per cubic foot. In the same manner a four foot cube containing 64 cubic feet and having a surface area of 96 square feet would cost 1½ cents per cubic foot.

Houses contain interior partitions and other factors, in addition to the outside walls, which control costs so that the cubic box illustration is slightly overdrawn. However, the principle still exists and recognition is given the fact that as the volume of a house increases its cost per cubic foot decreases.

In the course of investigations the division undertook considerable research on the relation of cost and volume and determined that the relation followed very closely the curve of an equilateral hyperbola. This curve was derived from the study of quantity survey costs of a number of houses of equal quality but varying size. In the matter of quality of the structures, there appeared to be no easy expressible relation.

The quality of houses may vary almost infinitely. However, from numerous inspections, it appeared that the most reasonable method of estimating quality was by use of certain features of a house; in other words "sampling."

Certain items of construction seem to give a fair indication of the entire structure. With this in mind, a schedule of items was prepared in which the presence or absence of these items could be shown by a series of checks and also their quality, good, fair or poor rated. The range of items extends from the type of foundation to the kind of roof and includes an adequate number of details within the range. The acquired data is processed by giving each item a numerical value or weight based on 100 for the highest type of house and graduated downward therefrom as the quality declines.

For the convenience of the appraisers, a tabulation of the cubic foot value of houses, in relation to their volume, has been calculated. This was done for weights of 100, 80, and 60. In practice it is necessary to interpolate between these figures for the weight that is developed by the inspection of the structure being considered.

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Estimating Market Value

After the cost of building the struc-

(*Continued on page* 116)

Preparation of Bases for Blacktop

By E. D. Devereaux
County Engineer, Shiawassee County, Mich.

This practical summary appeared in Highways and Byways, publication of the County Road Association of Michigan.

THE Shiawassee county (Mich.) road commission have been building bituminous surfaces on gravel roads since 1934 on a rather small scale each year except for the war years, when construction was entirely discontinued.

Many mistakes were made both in preparation of bases and in the mix itself, however, the most serious mistake was in not making any improvement to the base before the bituminous material was placed. During the early years of this work we used road mix entirely, and assumed the gravel road to have sufficient strength just by driving over the road and viewing the gravel at a time when the road was at its best. This haphazard way of base checking led to many disappointments.

Old Narrow Roads

Many of these roads were originally built with 9 ft. width of gravel and due to increasing the surface to a two-lane road, the gravel has been pushed out, thereby lessening the thickness and with a minimum of resurfacing we have found in many cases where there were only 2 to 4 in. of gravel remaining. Placing 2½ in. compacted depth black top on these bases where the heavy soils were encountered resulted in the failure of the blacktop to hold up under the loads placed upon them. This same blacktop placed on sandy or gravelly soils held up fairly well.

The experience which we have had in this work has led us to adopt the following procedure in preparation of our bases.

Due to not having sufficient funds or man power to conduct a study of the roads where the farm land is of a heavy clay or possibly frost heave material, we assume the entire road to be unsatisfactory and place a minimum of 6 in. of bank run gravel over the old road bed from shoulder to shoulder.

We do not use sand in this work as we have in most sections of the county, a good supply of bank run gravel which does not run heavy to oversize stone, and which we are able to purchase at from 10 to 25c per c.y. This saves us the added work of placing a gravel coating over any sand fill, and compacts much more readily thereby allowing traffic to use the road while under construction.

Where necessary to provide better drainage the ditches are cleaned with a grader and excess dirt, if of desirable material, is placed in low sections of the road or wasted. If the program has been laid out the previous year, we are then able to study the road during the spring breakup period and bad sections are marked by stakes which later will receive material up to 12 in. thick.

Under-body Blades

After this material is applied, a grader or under-body truck blade keeps the road graded to the proper crown which is to be used in the blacktop surface. If the season provides plenty of moisture, we do not use any dust layer but work a small amount of dirt from the ditches where possible to enable us to compact the added material. If moisture is not sufficient to compact the added material, then we use calcium chloride to do the job using about 6 tons to the mile covering about 24 ft. of road bed.

We believe that this compactness is very important to the future life of the road and also to its riding qualities.

When the support from a well compacted material is achieved by means of grading and perhaps dust layer when necessary, the wearing course needs to be thick enough only to take the abrasive action and motion of the vehicles and to waterproof the base, thereby keeping it compact and dry.

After the base is compacted and we are ready to apply the surfacing, a prime coat is placed which usually runs from 0.2 to 0.3 gal. per sq. yd. of some light bituminous material. If the road still has some loose material on the surface, a light blading removes it to the edges and a larger amount of prime is used running to 0.3 gal.

Traffic is detoured around the section primed if possible until the bituminous material has had a chance to

"CHANGE THAT IMMEDIATELY — THAT WAS ONLY A SPOT OF GRAVY ON THE SPECS!"

be absorbed or if no detour is available then a light application of sand is applied over the prime and traffic allowed on the road.

Traffic is allowed on the road until the surfacing is placed, which usually is only a few days.

The surfacing which we are using consists of a gravel processed to ¾-in. max. stone and with not less than 50% material passing a ten mesh sieve. This material must be free from clay or silt and where possible we use material containing 25% crushed stone, however, many of our pits will not permit us to obtain that much crushed material without a rather large increase in cost.

The bituminous material consists of a medium road oil and sufficient gravel is used to provide a compact surface 2 in. in depth and 20 ft. wide.

We used material produced by a bituminous plant during 1946 and have had very good results; however a road mix could have been used just as well on the prepared road base.

Well Drained Base

In general, we feel that the answer to the long sought question of how to build a good blacktop road lies primarily in a good heavy compacted base fairly well drained. However, we believe that except in some special locations the drainage is secondary to the compacted base and if this is provided, the surfacing will withstand the pounding of the traffic to a point where the traffic volume is heavy enough to warrant a more rigid surface.

This type of road has added greatly to the cost of the blacktop road, some instances about doubling the cost, however, this added cost is soon crossed off in the saving in maintenance and in the reaction a good blacktop surface has on the public, one that will come through the spring breakup with practically no ill effects. The only drawback to giving the public in our county a good dustless, all-weather road on roads where the traffic is of sufficient amount to warrant the expenditure, is in lack of funds, and we will leave that to the Governor of our fair state.

Contractor-Highway Committee

(*Continued from page* 108)

of specifications and design is secured.

Joint cooperation was also recommended on a national scale to promote legislation which will provide for continuing highway construction programs.

There was general agreement that there should be increased use of machinery for more efficiency and economy, that plans and specifications should be adapted to its use, and that field engineers must be educated to interpret plans and specifications to permit more mechanized operations when they can perform the required operation satisfactorily.

Pay for Engineers

Highway officials and contractors agreed unanimously that adequate numbers of good engineers were essential to plan and administer programs which can be carried out most efficiently and economically.

Two resolutions were adopted. One recommended that the Southeastern Association of State Highway Officials consider a resolution petitioning the state legislatures to adopt adequate pay scales. The other recommended study by the association of a merit system to recommend to the states to give engineers greater security and better opportunity for promotion on merit.

During the discussion on how to secure more bids, contractors pointed out that in the states where departments rejected bids on a large scale, contractors sought work elsewhere. The experience with states which accepted most bids was that there was increasing competition and better prices.

At conclusion of the discussion the meeting adopted a resolution recommending that the Southeastern Association give study to a uniform system of prequalifying contractors.

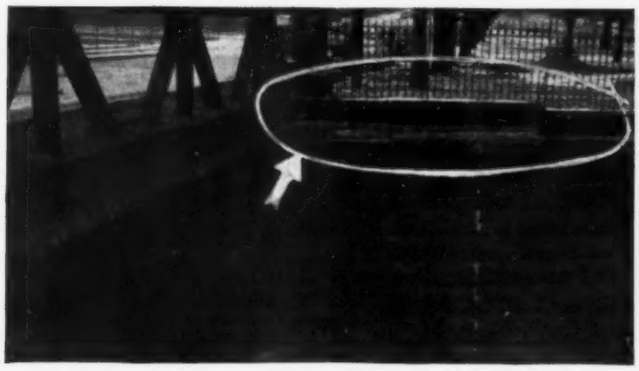
Bids Asked on Hula Dam Work

On or about Jan. 19, 1948, the Tulsa District, Corps of Engineers, Tulsa, Oklahoma, received bids for the construction of spillway and completion of embankment, Hula Dam, Caney River, Oklahoma. Approximately 900 calendar days will be permitted for completion of the work. Principal quantities include: 1,200,000 cu yd. earth excavation; 300,000 cu. yd. rock excavation; 1,150,000 cu yd. compacted earth fill; 140,000 bbl. cement; 90,000 cu. yd. concrete; 560,000 lb. structural steel bridge; 1,000,000 lb. steel reinforcement; 1,000,000 lb. Tainter gates and embedded metal therefor; 95 ft. x 6½ ft. hydraulic operated sluice gates; 11 acres seeding and mulching, and 11 acres sprigging and overseeding.

Ohio Safety Signs Go Burma Shave One Better

"What's your Hurry"—"Take It Easy"—"Get there Safely" is the wording that greets motorists as they head eastward into Ohio from the Indiana line on U. S. 40. As pictured here, the signs are of distinctive design, the color scheme being a combination of black, white and yellow. The three signs are spaced about 150 ft. apart.

Ohio like other states supplements its standard signs and markers with special warning signs and safety devices where needed. The R and S. editors invite readers to send in snapshots of special signs that have been found effective in their states, counties or cities.



★ Photo group: Top, left scene shows Ridge Ave. bridge after raising deck above old grade. Second view, pouring concrete for new curbing. Third view, new stone abutment wall after raising. Last view, general character of this bridge, which weighed 648 tons

Street Bridges Raised to Clear Bigger Locomotives

Following brief data and snapshots supplied through courtesy of Roy A. MacGregor, executive secretary of Constructor's Association of Western Pennsylvania.

A somewhat unusual job—that of raising overhead street bridges which have been in place for many years on Pittsburgh's North Side—was completed early in the past year by Booth & Flinn Company of that city.

This project involved the lifting of the Ridge Avenue, the West Ohio Street and the Pennsylvania Avenue bridges, all of which cross the Pennsylvania Railroad tracks, in order to provide additional clearance for the new type of locomotive which the Pennsylvania Railroad plans to put in service.

The highest lift was at West Ohio Street where, in addition to maintaining trolley traffic over the bridge and rail traffic under it, the contractor raised the span 24½ inches. The heaviest bridge was the Pennsylvania Avenue, which weighed over 1078 tons and was raised 17 inches.

Typical of all the operations was the work on the 648-ton Ridge Avenue bridge, pictured here.

After some revision of plan it was decided that because there was insufficient clearance between the outside tracks and the retaining walls for temporary supports, the method used would be to cut a portion of the abutment seat out and set jacks under the rear half of the bridge shoe. Except for the sidewalk sections where lighter jacks were used, hydraulic jacks varying in capacity from 100 to 300 tons and operated by electrically driven pumps were used at each end. It took only one day to raise the span the desired 11 in. by this method after the jacks were set.

The negotiated contract for this project also called for regrading up to the new level and curbing and paving to meet city requirements.

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Reflectorized Paint for Metropolitan Roads—The State Highway Department of Virginia is planning to use reflectorized paint for highway pavement marking around the metropolitan sections of the state. Studies have shown that reflectorization will be of benefit on heavily-traveled sections of metropolitan highways where there is dense marginal development.

More and Better Trucks Due

. . . says truck manufacturing executive, who notes struggle of truck makers to get back to and surpass prewar quality. Training of mechanics and better planning of preventive maintenance important to highway, municipal and contractor organizations

A LARGE percentage of trucks in service still show war-weariness, reminded D. B. Erminger of International Harvester Co., at a recent meeting of the Chicago chapter of the American Public Works Association. Mr. Erminger is manager of the motor truck service division of this firm and a veteran of both wars, having served in an important capacity in the transport effort of World War I and in the Pacific, China and CBI in the recent war.

Noting that fleet owners are still handicapped by a shortage of new trucks, he forecast a perceptible catching up with truck demand in 1948. Meantime his counsel is to keep up the good work in patching and preventive maintenance. Many trucks turned out in the first two years after the war are frankly admitted by their makers to have incorporated sub-quality parts, due to lack of proper steels and to factory conversion problems generally. This has been especially true of brakes, engine bearings, transmissions and rear axles.

However, manufacturers have progressively brought the quality of these parts back up, and while not every detail of a truck is today as good as prewar, many of its parts surpass prewar in quality. As an example, Mr. Erminger cited "77" bearing material, which withstands 40% higher oil temperatures and has longer service life than the best prewar bearings.

Better Valves Today

Then there are stellite faced valves with stellite seals said to be superior to anything available before and good for 100% longer valve life.

Clutch and brake linings are now back "as good as."

Intake valves have been improved, although giving some trouble mainly because the present gasoline is exceptionally dry; a little oil must be added to our "dry" high-octane gas, noted Mr. Erminger.

You can now expect gears to be potentially the toughest ever, thanks to shot peening before grinding, more modern heat treatment and use of copper, cadmium or other plating to insure a polished surface for the breaking-in period and thus prevent scuffing.

Thin-walled brushings are now used in various places, but these must be pressed in correctly and then burnished and broached.

The truck manufacturers today are emphasizing mechanic and service men training for reasons such as these and because of the general need to rebuild a generation of peacetime trained men. Training or refresher courses are needed even for the so-called good mechanics, in order to acquaint them with modern testing equipment, if for no other reason.

During the war the best mechanics gravitated into war plants or became specialists in some phase of Army equipment procedure. With good all-around men so scarce today, Mr. Erminger counsels fleet owners to use less experienced mechanics in motor removal and installation, and if the fleet is large enough to organize "line" work so that specialists can be fitted in on one duty or another. Harvester branch or distributor shops work this trick and now send overhauled trucks out in hours rather than days.

As a final warning Mr. Erminger suggests that owners realistically face a continued stringency in new truck deliveries in '48, and inventory their truck conditions this winter, step up preventive maintenance and plan their year's maintenance and repair operations so that best use can be made of slack time in the shop.

How to Appraise Housing for Condemnation

(*Continued from page* 112)

ture new has been established, it is necessary to estimate the market value. As has been mentioned herein, people will not normally pay new costs for a used article. The difference between the new cost and what people will pay is the depreciation. Part of it, attributed to wear-out or decay, may usually be associated with the age of the structure, and part to out-of-dateness. Some of the depreciation may be because of changes in the neighborhood environment. The over-all effect of depreciation from all causes, is thus, somewhat elusive. However, it is possible to gauge approximately the total depreciation in structures by finding the actual sale price of similar structures and the relation of sale price to new cost. This involves the examination of a representative number of properties which have been sold in open market, calculating their reproduction cost and comparing it with their sales price.

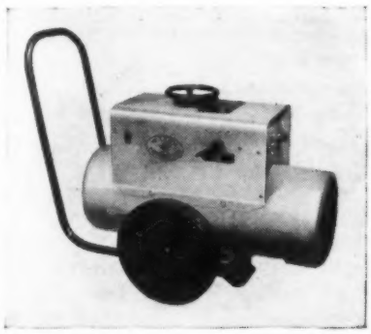
The selection of sales, which offer a close comparison with respect to location, age and type, to the subject property, is of extreme importance. When proper comparisons have been made and the results properly processed, the determination of value appears to be a science rather than a guess.

New Construction Equipment and Materials

1

New Welding Machine

A new Wilson "Hornet" 36A motor generator arc welding machine has been announced by Wilson Welder & Metals Co., Inc., New York, N. Y. The new "Hornet" 36A of compact



"Hornet" 36A Arc Welder

design and available in 200, 300 and 400 ampere models, is a heavy duty machine with simple control of current that is easy to adjust and preset accurately. It is smaller in size and weighs one-third less than the previous "Hornet" models. This machine is designed for either 220 or 440 volts with no change in relays or additional wires being required for voltage reconnection.

2

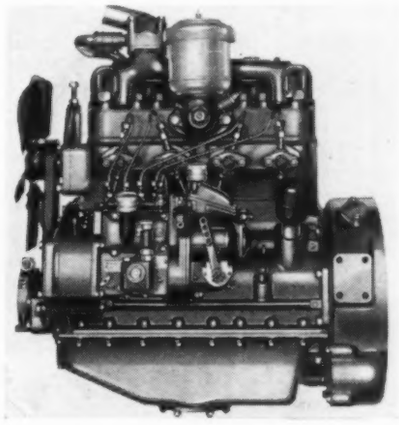
New Welding Rod

A new color-matching flux-coated torch welding rod announced by Eutectic Welding Alloys Corporation, New York, N. Y., is designed specifically for all types of gray or alloy cast iron and to eliminate the uncertainties and delays of manual fluxing when welding stressed cast shapes. This rod develops a tensile strength of 48,000 psi in the weld deposits, bonding at 950°-1,400° F., with a remelt temperature of 2,200° F. Its coefficient of expansion is the same as that of gray cast iron, and its hardness is approximately 190 Brinell, producing welds that are fully machinable.

3

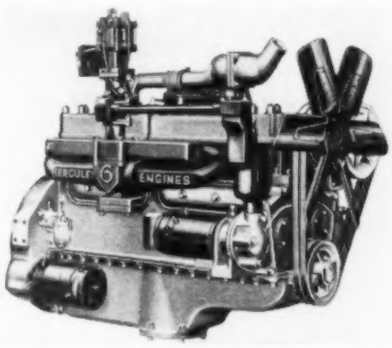
New Engines

Six Diesels and two gasoline engines have been added to the line of Hercules Motors Corporation, Canton, O. The Diesels are of the high speed, light weight, heavy duty type, and include the following models: Model DIX-6 is a 6-cylnder engine with



Hercules Model DIX-4 Diesel Engine

3⅜ in. bore and 4 in. stroke. It develops 93 hp. and weighs approximately 750 lb. Model DIX-4 in 4-cylinder engine and is built in two different bore sizes. The 3¼-in. bore and 4-in. stroke engine develops 46½ hp. at 3,000 r.p.m. The 3⅝-in. bore and 4-in. stroke engine has a power output of 3,000 r.p.m. of 57 hp. The stripped engines weigh approximately 600 lb. The Model DJXHF horizontal engine develops 99 hp. maximum power at 2,600 r.p.m. The stripped



Hercules Model TDXB Gasoline Engine

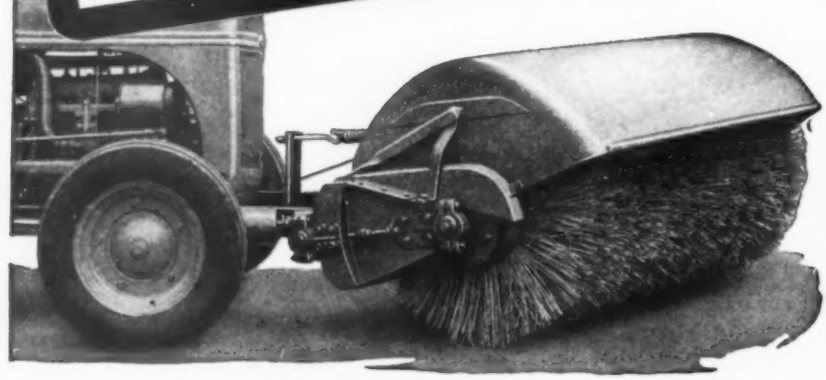
engine weighs approximately 900 lb. The Model DWXLDF horizontal engine with 4½-in. bore and 5-in. stroke develops 142 hp. at 2,600 r.p.m. Piston displacement is 426 in. The stripped engine weighs approximately 1,300 lb. The Model DFXHF develops 260 hp. at 2,100 r.p.m. The stripped engine weighs approximately 2,600 lb. Model DNX-V8 is an 8-cylinder 45° V engine. It is built in three sizes, developing 340 hp., 365 hp. and 400 hp. at 2,100 r.p.m. The approximate weight is 4,200 lb.

The two new gasoline models are high speed, heavy-duty engines. The 6-cylinder Model TDXB has a 4⅜-in. bore and 5¼-in. stroke. It develops 160 hp. at 2,600 r.p.m. Piston displacement is 474 in. The stripped engine weighs approximately 1,345 lb. The 6-cylinder Model RXLDH is another high speed, powerful heavy-duty gasoline engine. It has a 4¾-in. bore and 5¼-in. stroke. It develops 180 hp. at 2,600 r.p.m. and has a piston displacement of 558 in. The stripped engine weighs approximately 1,470 lb.

Mail Inserted Card

For data on equipment described on these pages. See also inquiry blank on page 132.

For Better Asphalt Paving . . .
For Removing Snow and Debris from
Streets-Alleys-Sidewalks



LITTLE GIANT POWER SWEEPER

Widely used for cleaning the street furnace before applying the seal coat in asphalt paving. Assures more permanent paving—helps eliminate bubbles or blisters. Also used for city clean-up work and snow removal.

For All Tractors, Jeeps

Little Giant Sweeper mounts on all tractors and Jeeps, normally requiring less than 90 minutes to attach. Operates from power take-off. Brush sets at 30 degree angle. Sweeps to right side of tractor, outside of wheel path. Sweeps against forward motion of tractor for increased efficiency. Dependable chain drive—all moving parts are scheduled for operator's protection.

Long-Wearing Brush—Dust Hood

Brush lengths of 5, 6, 7, 8 and 9 feet can be furnished. The 5-foot length is recommended for sidewalk snow sweeping. Long-wearing Palmyra brush fibre, refillable at nominal cost. Adjustable ground pressure—brush can be quickly set to fit all sweeping conditions.

Dust hood helps keep tractor clean—assures clear vision for operator. Hood can be removed in 15 minutes for sweeping snow.

Little Giant gets the sweeping job done faster. It quickly pays for itself in labor saved. The initial investment is low—very little upkeep expense. Can be used year-round—for snow in the winter and rubbish the rest of the year. Designed by experts with years of experience in the sweeping field. Widely used by municipalities, airports, road contractors and industrial concerns.

We are in production and can make prompt delivery. Let us send you complete information and prices. Write

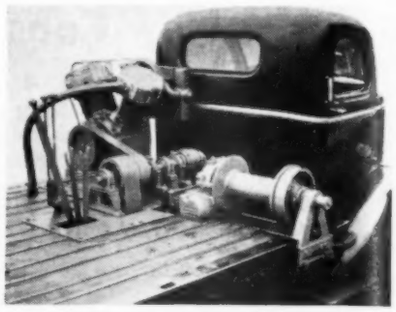
LITTLE GIANT PRODUCTS, INC.

1581 N. ADAMS ST.
PEORIA 3, ILLINOIS

4

New Air Compressor—Winch Assembly

A new truck-mounted "Auto-Air" compressor-winch assembly has been annouced by Davey Compressor Co., Kent, O. Power for operation of both compressor and winch is transmitted from the truck engine by a Davey heavy duty power take-off installed in



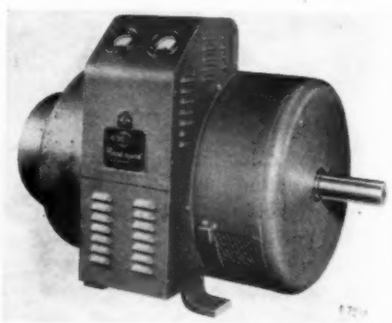
Davey Compressor—Winch Assembly

the truck's drive-shaft. Countershaft with two individual Twin Disc clutches provides for either simultaneous or separate operation of compressor and winch. The compressor is a standard Davey Model 105-VC "Auto-Air". It delivers 105 c.f.m. at 100 lb. pressure. Winch is of 25,000 lb. capacity. Air receiver and double hose reels are mounted beneath the truck platform, thus effecting substantial space savings. The unit extends only 40 in. behind the truck cab, leaving ample space for the transportation of men, tools and materials, and is 38 in. high.

5

New "Packaged" Generator

A new "packaged" generator, announced by Electric Machinery Mfg. Co., Minneapolis, Minn., for use in engine-generator sets is a compact, factory-assembled unit including re-



New "Packaged" Generator

volving-field generator, direct-connected exciter, automatic voltage regulating circuit, meters, and selec-

tor switch for pre-setting voltage. The only external connections needed are leads to a generator switch. The built-in automatic voltage regulating circuit has no moving parts and requires no maintenance; it is permanently connected and factory-adjusted to hold terminal voltage within 2% of the voltage selected, at any load or power factor within the generator rating. Popular 60-cycle ratings at standard voltages and 0.8 power factor include:

18.7 kva
25 kva
31.3 kva
—1,200 r.p.m.

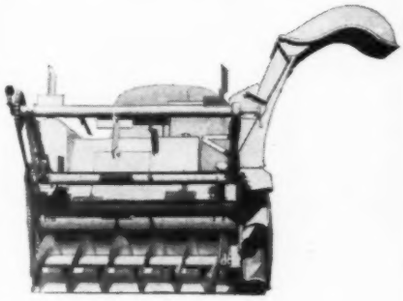
25 kva
31.3 kva
37.5 kva
—1,800 r.p.m.

The principle of electrical resonance, long used for needle-sharp tuning of radios, is used to hold constant voltage.

6

New Rotary Snow Plow

A new rotary snow plow, called the SnoMaster, announced by Iowa Manufacturing Co., Cedar Rapids, Ia., is a self-contained unit which can be attached to or detached from almost any 2½ to 5-ton four-wheel drive truck. There is no extra power unit to mount and no special transmission is required. Rotary picks driven by chains and suspended by springs in front of the plow can be raised or



The SnoMaster

lowered by hydraulic controls in the truck cab to break down drifts or cut away frozen snow on the ground. The 18-in. auger is ball-bearing mounted and is driven through a shear pin flange for safety. Rotor is a disc with six blades of special steel and provided with a shear pin. An eight cylinder, 114 h.p. engine equipped with starter and generator supplies the power. Drive is through fluid drive and flexible coupling. Transmission is in a compact, oil-tight case. A specially designed chute, controlled from the operator's cab, will throw the snow to the right or left. A removable loader hood at the top of chute, also controlled from the cab, can be

HIGHWAY ENGINEERS SPECIFY
and CONTRACTORS USE

The JACKSON VIBRATORY PAVING TUBE

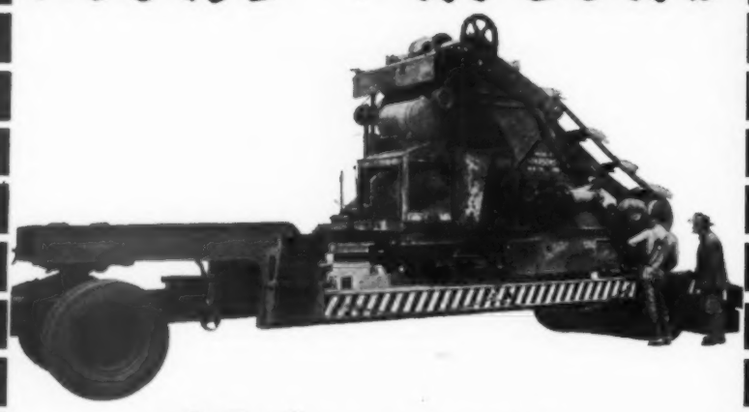
DON'T BE LATE FOR '48!
GET THESE ADVANTAGES!

Important savings in cement can be made. Finishing progress is much more rapid. Concrete at forms and joints is puddled perfectly. Spreading costs reduced. Complete compaction and excellent finish obtained with less labor.

The JACKSON Paving Tube is perfectly adaptable to slabs 6" to 24" thick, without affecting the efficiency on single or two-course standard plain or reinforced concrete pavement construction and may be quickly adjusted from 10' to 25' widths in the field. Power Plant mounted on the Finisher has ample reserve power through entire frequency range of 3000 to 5000 VPM. Finger tip controls. Quickly and easily attached to any standard finisher — and can be attached to the rear of standard spreaders to advantage for vibrating the first course in thick slab construction. One of the best investments in equipment a paving contractor can make. See your Jackson distributor or write for further information NOW.

Manufactured by ELECTRIC TAMPER & EQUIPMENT CO. for
JACKSON VIBRATORS, INC. LUDINGTON, MICH.

MORE PAYLOAD



with less tractor and manpower

These strong, rigid lowbeds are built for one purpose only —to get heavy equipment on the job at the lowest possible cost in time, tractor and manpower. Engineered for easy pull; *built to take the load;* this W-W Lowbed has a 25 ton rated capacity but its actual load limits are determined only by size and condition of tire equipment.

Heavy duty oscillating axles carry 8 tires in line. The free, independent crosswise action of the oscillating axles assures even load distribution on all tires at all times regardless of road contours. Heavy duty railroad type coil springs cushion road shock, assure long trouble-free frame life.

Heavy 14" x 10" structural steel frame... 2" hardwood planking laid flush with main frame beams; flat gooseneck for additional loading space; all necessary tractor connections; *PLUS* a choice of body types are other advantages of the W-W 25 "SA" model. This W-W Lowbed is available in a skid-loaded model or with a beavertail and exclusive loading ramps enabling one man to load self propelled equipment.

Immediate delivery is available on any model from 10 to 60 ton capacities. For pictures and complete specifications simply attach coupon below to your letterhead and mail today.

The WINTER-WEISS Co.

2201 BLAKE STREET DENVER 2, COLORADO

Gentlemen: Please send me complete information on your Lowbed trailers. We are particularly interested in a_____ton model.

Firm Name_____

Address_____

City_____ Zone____ State_____

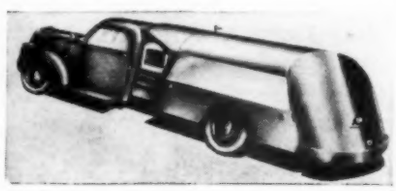
By_____ Title_____

adjusted so the snow can be blown off the road or airport runway or directly into trucks when cleaning city streets. The SnoMaster weighs approximately the same as a heavy duty push plow so it can be quickly interchanged with one-way or V-plow by using the same attachments.

7

New Street Flusher

A new street flusher, built in 1,200, 1,600 and 2,000 gal. capacities, has been added to the line of road and street maintenance equipment of Rosco Manufacturing Co., Minneapolis, Minn. The new flusher includes such features as one master directional flow control valve which controls one or all flushing nozzles—Clayton Hy-trol valves—larger pump and engine capacity and more flushing pressure at the nozzles. Lower center of gravity increases appearance—tank weight equally distributed through use of longitudinal sills over entire truck frame—wrought steel piping throughout—Victaulic couplings to reduce motor vibration transmission to tank. The flusher is standard equipped with either Hercules IXB, 4-cylinder engine or Hercules QXC5, 6-cylinder engine, which will include radiator, air cleaner, water pump, full pressure lubrication, electric starter, 7-gal. gasoline tank, and in either case is equipped with a 650 GPM Gould pump, bronze fitted, and mounted integral with engine.



New Rosco Street Flusher

8

New Fuel System Cleaner

A new liquid carburetor and fuel system cleaner which also prevents gas line freezing has been announced by Pennsylvania Refining Co., Cleveland, O. The new product, known as Penn Drake Gumout is said to be compounded of 100% active ingredients—special powerful solvents not diluted in any way. According to the manufacturer, one pint added to 10 gal. of gasoline, once a month or every 1,000 miles of driving, completely dissolves all gum and foreign deposits, keeping carburetor jets,

needle valves and the entire fuel system open and clean. Gumout also absorbs water present in the gasoline tank thereby preventing ice formation. It is harmless to metals, gaskets, leathers, and fuel lines. The manufacturer especially recommends use of Gumout in the construction field because it absorbs water in fuel and dissolves and prevents gum formations. This eliminates the necessity of draining fuel tanks when equipment is inactive due to bad weather, repairs, or job delays and assures proper functioning of the fuel system at all times.

9

New Leaf Collector

An important mechanical contribution to the municipal field is a leaf collector developed by Good Roads Machinery Corporation, Minerva, Ohio. The unit is trailer-mounted and carries a gasoline powered motor which operates a specially designed, enclosed high speed rotor that picks

★ The unit discharges a load of well compressed leaves suitable for use for a mulch or compost

★ The Good Roads leaf collector, tractor drawn, with a snow plow mounted on the tractors to help windrow the leaves

up the leaves and discharges them into a steel body with wire mesh sides. The rotor intake is connected to a flat-mouthed funnel by means of a large flexible tube. The operator easily guides the flat-mouthed intake funnel by means of a rubber tired handle bar frame. The unit may be drawn by either a tractor or a truck. The body has its own hydraulic dumping device.

The equipment is said to have been tested publicly in the New Jersey,

TRAFFIC MUST GO ON

THE MODEL "E" SPREADER PROVIDES DRIVING SAFETY

AT A MOMENT'S NOTICE the Highway Model "E" starts saving lives by spreading a protective coat of sand or cinders or other material on icy streets, highways, airport runways, etc. This one-man unit skid-proofs a 2 or 4 lane highway in one operation.

CHECK THESE POINTS OF SUPERIORITY

- Extra large distributor disc uniformly distributes material at all speeds.
- Spreads material on highway where needed. None wasted on shoulders.
- Spreads to right or left or to both sides while truck is operating in forward or reverse.
- Ball bearing gear boxes, oil tight, dust and water proof.
- Self unloading 24" wide conveyer assures steady material flow.
- Hopper sides hinged for easier hand loading.
- All controls operated from cab of truck.
- With optional clutch assembly spread may be started or stopped when truck is in motion.

● THE HIGHWAY MODEL "E", with adjustable baffle which directs the spread, saves time and material. Truck travels in safety because material is also cast ahead of the rear wheels of truck for traction and low to prevent interference with traffic. Material will not freeze to the sides of the sturdy wood hopper. Entire framework is made of steel, electrically welded. In sizes to fit any truck chassis. Widely used by highway departments and cities. Act now, bad weather won't wait. Write today for complete information.

***Versatile**—In the summer the Highway Model "E" spreads calcium chloride for dust control, sand or chips for seal coating over newly laid oil and aggregate for general road maintenance. It works the year around.*

SOLD AND SERVICED BY LEADING CONSTRUCTION MACHINERY DEALERS THROUGHOUT THE UNITED STATES, CANADA AND FOREIGN COUNTRIES

HIGHWAY EQUIPMENT COMPANY, INC.

605 D Avenue N. W. **Cedar Rapids, Iowa**

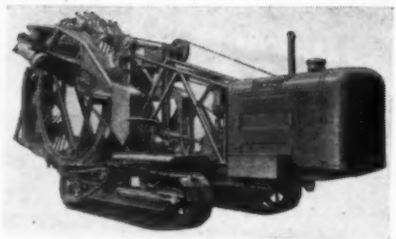
MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

Pennsylvania and the Washington, D. C. areas. About 600 officials from communities in those areas have seen the unit in operation and have expressed a keen interest in it. The machine demonstrated its ability to handle wet as well as dry leaves.

10

New Ditcher

A new Buckeye Model 312 ditcher, succeeding the widely used Model 12, has been placed on the market by Gar Wood Industries, Inc., Findlay Division, Findlay, O. Compared with its predecessor, this new model ditcher offers greater range, simplified controls and better balance. It is built for longer service, faster digging, and reduced operating and maintenance costs. Model 312 cuts ditch 16 in. to 30 in. wide (depending upon the buckets used) and up to 6 ft. deep, as compared to the 5½-ft. maximum cutting depth of the old Model 12. The digging wheel is supported by a rugged frame made of tubular members; a design which has proved its advantages in aircraft construction. Model 312 is several inches shorter than the old Model 12, and approximately 500 lb. lighter. Its diesel engine develops 67 h.p. at 1,600 r.p.m. A fluid coupling in conjunction with a friction clutch permits loads to be picked up or relieved with either or both. Digging speeds up to 57.5 ft. per minute are provided. This is over 50% greater than the maximum digging speed for the former Model 12. The new ditcher has four forward and four reverse road speeds.



New Buckeye Model 312 Ditcher

The Moto-Paver Does the Complete Mixing and Paving Job

At right: Resurfacing old macadam road in West Virginia.

Above: Moto-Paver is especially adapted for resurfacing secondary roads and city streets.

In One Continuous Operation

Above: Aggregate may be dumped directly from trucks into front hopper, as shown here, or picked up from windrow, using an H & B Moto Loader.

● Moto-Paver, the complete traveling mixer and paver, delivers, spreads and strikes off the mixed material on the road surface—ready for rolling. The strike-off blade is adjustable to hold accurately to the specified grade and crown—producing a smooth, non-wavy surface even when resurfacing over rough or irregular pavement. The Moto-Paver has been successfully operated using gravel, stone or slag aggregates, and with most types of emulsions including RC, MC and SC asphalt and tars. Bulletin MP 47 sent on request.

HETHERINGTON & BERNER INC.
721 Kentucky Ave., Indianapolis 7, Ind.

H&B Moto-Paver
THE COMPLETE TRAVELING MIXER AND PAVER

11

New Cab for Tractor

A new, all steel welded cab, designed exclusively for attachment on the new 115 h.p. "Caterpillar" Diesel DW10 wheel-type tractor, is in production by Caterpillar Tractor Co., Peoria, Ill. Offering year-around utility of the tractor and eliminating the threat of job interruptions due to inclement weather, the cab provides increased comfort for operators and complete protection from the elements. Of durable construction similar to that of the cab offered with the "Caterpillar" Diesel motor grader, the new cab permits maximum visibility and maneuverability for the operator. The door and side and rear panels are removable.

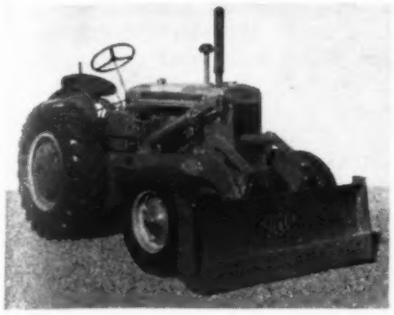
New Cab for Tractor

12

New Bulldozers

Three new type heavy-duty bulldozers, especially designed for Case industrial wheel tractors, are now being manufactured by American Tractor Equipment Corp., Oakland, Calif. These bulldozers cut the full width of

tractor. Bowl design is the same rigid, internally-ribbed, welded box as used in ATECO dozer for big track-type tractors. Bulldozer is securely fastened to tractor at the transmission case, draw-bar pad and rear axle housing. Bowl and push members are built to take full drawbar power of the Case tractor in the roughest kind of work. Bulldozer push members are pivoted above the rear axle so part of the working load



New ATECO Bulldozer

is transferred to the rear wheels to increase traction. Push members do not interfere with steering; front wheels will turn in normal tractor radius even when blade is in dozing position and below ground level. Blade is powered both up and down by front-mounted hydraulic pump, which assures constant power without gear shifting.

MANUFACTURERS' LITERATURE

13
Arc Welders

The Hobart Brothers Co., Troy, O., now has available a new 36-page, 3 color catalog containing illustrations, descriptions, dimensions and specifications on its complete line of "Simplified" arc welders. Various features comprising the machines are individually illustrated and described, and helpful information is given for various welding problems.

14
Ball Bearings

A 260-page ball bearing catalog K, containing 100 pages of engineering information and data has been issued by the Federal Bearings Co., Inc., Poughkeepsie, N. Y.

The first section describes and illustrates all of the many types of antifriction bearings produced by Federal and contains interchangeability and conversion tables. The engineering data section contains detailed information on calculation of loads, various bearing load conditions, a load modifying chart, lubrication and care of bearings, and various formulas, tables and equivalents of help to the engineer. The final section catalogs the aircraft bearings produced by Federal.

15
Truck Loader

The Butler truck loader is illustrated and described in a circular issued by Butler Engineering and Manufacturing Co., Los Angeles, Calif. The loader has a clam type shovel and can be installed on 1½-ton trucks. Operations are under control of the truck driver at all times. The shovel can be stopped in any position in its arc, facilitating the discharge of the load in any desired spot. The loader is available in two models—width 4 ft. and 6 ft.; struck measure. 12 cu. ft. and 14 cu. ft.; lifting capacity 1,400 lb.; operation cycle, 25 seconds; weight 1,600 lb., oil 1,675 lb.

You get a real lift with a **HANSON Crane**

Low center of gravity; full revolving; air controlled steering; extra long crawlers; all clutches easily adjusted and relined without dismantling shaft assemblies; heavy duty industrial type gasoline or diesel motor; and other outstanding features!

Write for Catalog RS-148.

Rated at 4½ ton lift (the larger size is rated at 6½ ton) this rugged smaller brother in the Hanson family can juggle its rated tonnage with effortless ease and have hoisting power to spare!

It is quickly convertible to Shovel (⅜ yd. and ½ yd.) Dragline, Clam-shell or Trench-hoe. Above the illustration are listed a few of the features which, built into this smooth-working, trouble-free, profit-making unit, have helped make it popular around the world:

Other HANSON products: Yard & Dock Cranes -- Truck Shovels -- Heavy Duty Machinery Trailers.

HANSON
CLUTCH AND MACHINERY COMPANY - TIFFIN, OHIO

45 TONS
OF 15 FOOT PENSTOCK TUBE
is successfully transported on this
ROGERS HEAVY DUTY TRAILER
Extreme lengthwise and crosswise axle oscillation is attained in the rear end design of this type D Trailer. This load rides evenly and easily as the trailer wheels readily conform to roadbed irregularities.
EXPERIENCE builds 'em • PERFORMANCE sells 'em

ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
110 ORCHARD ST. ALBION, PENNA.

This 2½ cu. yd. Sauerman Power Scraper cuts deeply into hill of gravel and moves about 85 cu. yd. of material an hour to crusher. The scraper tail-block is attached to a movable A-frame located on the brow of the hill.

Great Flexibility
Sauerman machine can reach across a stream, pond, pit or stockpile or to top of hill and move material rapidly from any point within its cable radius. The radius can be extended as far as 1,000 ft. or more.

Write for Catalog
Completely Illustrated book describing many typical installations sent on request. Our Engineering Department will gladly advise on your own problems.

SAUERMAN POWER SCRAPERS

With a Sauerman Power Scraper you can simplify many excavating and stockpiling jobs that involve moving materials short distances. A Sauerman machine digs a heaping load, hauls this load to any desired point within its operating radius, dumps automatically, then returns at high speed to dig another load. Bucket capacities run from ¼ to 15 cu. yds.

Operation and Upkeep Are Simple . . .

The operator of a Sauerman Scraper has control of everything at his finger-tips. Any workman is easily trained for the job. Power consumption is small. Installation and upkeep costs are surprisingly low.

SAUERMAN BROS., INC. 588 S. CLINTON STREET CHICAGO 7, ILLINOIS

16
Welding

Two bulletins on maintenance and production welding are now available from Eutectic Welding Alloys Corporation, New York, N. Y.

Entitled, "Arc Welding Problems Successfully Solved" one bulletin covers welding cast-iron, low and high alloy steels, stainless steel and tool steels to high carbon steels; welding special manganese parts, elimination of undesirable characteristics, and other problems occurring in everyday welding. Twelve production case histories are well presented. The other bulletin, "Another Major Advance in Gas Welding," describes the use and applications of various new developments in the field of special flux-coated alloys known as EutecRods, for steel, cast-iron, brass and aluminum. Correct welding procedures, together with physical properties, charts, and valuable technical data are well outlined and illustrated. Applications discussed include steel, cast iron malleable, bronze, brass, copper.

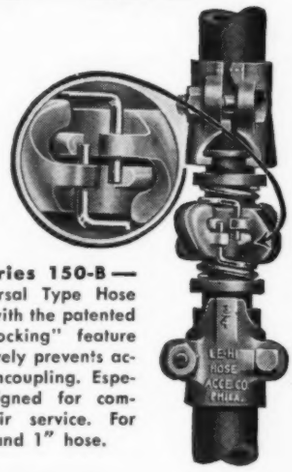
WITH THE MANUFACTURERS & DISTRIBUTORS

Smith Appoints Madrid

Smith Engineering Works, 532 East Capitol Drive, Milwaukee, Wis., manufacturer of "Telsmith" crushers and equipment for mines, quarries and gravel plants is pleased to announce the appointment of Sam A. Madrid as western representative. He will cover all of the states west of and including Montana, Wyoming, Colorado and New Mexico, and will assist dealers.

Mr. Madrid is exceptionally well qualified for this new work, having had many years' experience with crushing equipment, particularly in the mining field. After receiving college training in Metallurgy in Colorado, he spent time with mining companies as assayer, chemist, metallurgist, mill designer and erector, mill superintendent, mining consultant and mine owner. For the last ten years, he has been selling crushing equipment to the mining, quarry and gravel plant operators and contractors, including three years with Telsmith in South America.

LE-HI



LE-HI Series 150-B — The Universal Type Hose Coupling with the patented "Safety-Locking" feature that positively prevents accidental uncoupling. Especially designed for compressed air service. For ½", ¾" and 1" hose.

HOSE COUPLINGS

LE-HI Series 200-G or W — "Light Type" Air Hammer Hose Couplings. For *lighter* rock drills, jack hammers, sinkers, tampers, etc. Fast, easy coupling and uncoupling. Fully interchangeable. For ½" and ¾" hose. Available in ground joint and washer types.

ARE TOUGH

LE-HI Series 350-G or W — Heavy Duty Air Hammer Hose Couplings. Designed for the toughest kind of jobs. For *heavy* jack hammers, rock drills, and sinkers; also drifters, stopers, wagon drills, etc. Maximum air flow. Leak-proof seal. For ¾" and 1" hose. Ground joint and washer types available.

LE-HI MAKES A GOOD CONNECTION!

Go to your local distributor for these rugged, economical LE-HI Hose Couplings — NEVER SOLD DIRECT.

LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS

HOSE ACCESSORIES CO.
2762 North 17th Street
Philadelphia 32, Pennsylvania
Branches at Chicago, Houston and Los Angele.

Lima Personnel Changes

The Shovel and Crane Division of Lima Locomotive Works, Inc., Lima, O., has announced that the vacancy caused by the untimely death of G. L. Lillard, former district manager at Memphis, Tenn., will be filled by Fred L. Maus. Mr. Maus will cover the states of Tennessee, North and South Carolina, Georgia, Florida, Alabama, Louisiana, and Arkansas. He is well-known in construction and equipment circles throughout the South, having worked out of the Memphis office before being made district manager at

F. L. Maus

R. A. Otterness

Dallas, Tex. R. A. "Bob" Otterness of Spokane, Wash. former sales representative in the southwestern and northwestern territory, has been appointed to succeed Mr. Maus at Dallas as district manager covering the states of Texas, New Mexico, Colorado and Oklahoma.

International Harvester Personnel Changes

W. K. Perkins, manager of sales, International Harvester motor truck division, has announced the following changes in branch personnel: R. W. Maxwell has been promoted to assistant branch manager of the Buffalo motor truck branch. Mr. Maxwell, formerly manager at Binghampton, N. Y., started his career with Harvester at Columbus, O., in 1926. J. F. Adams, formerly assistant manager of the Charlotte motor truck branch, has been transferred to the Nashville motor truck branch as manager succeeding J. P. Lauffer, who has resigned to enter business as an International truck dealer at Columbia, Tenn. Mr. Adams started with the company at Charlotte, Tenn., as a retail salesman in 1936.

Day Appointed Research Director

W. E. Day has been appointed director of research for Mack Trucks, Inc. He formerly was chief metallurgist for Mack, and also general foundry superintendent.

Penn Drake GUMOUT

cures engine ills

★ **Cleans carburetors**
★ **Prevents gas-line freezing**
★ **Eliminates water**
★ **Reduces carbon formation**
★ **Makes starting easier**
★ **Maintains engine efficiency**

Contractors, utilities, highway departments, in steadily increasing numbers, are now using Gumout to keep equipment operating longer at top efficiency.

Gumout is composed of 100% active ingredients . . . powerful undiluted solvents. One pint to ten gallons of gas, every 1,000 miles or 60 hours of operation, dissolves gum and foreign deposits . . . keeps carburetors and fuel systems clean for efficient, economical operation.

Gumout also *freeze-proofs* the entire fuel system. It absorbs water in gas tanks and fuel lines.

Gumout is supplied to fleets in 5 gal. pails; 15, 30 and 55 gal. drums (sold in pint cans by gas stations and garages everywhere). Write today for full details and list of users.

Penn Drake Snow Plow Wax is the new liquid wax that makes snow removal faster, easier, cleaner.
Literature on request.

PENNSYLVANIA REFINING CO.
2694 Lisbon Road, Cleveland 4, O.
Butler, Pa. Edgewater, N. J.

Asphalt Institute Elects

A. M. Maxwell

At their annual meeting Dec. 3 the Board of Directors of The Asphalt Institute elected A. M. Maxwell of The Standard Oil Co. (Ohio), Cleveland, O., president and chairman of the Executive Committee, with Wallace D. Craig, Standard Oil Co. of New Jersey; D. N. Myers, Byerlyte Corporation; L. W. Lee of Husky Refining Co.; Harold J. Buck of Talco Asphalt & Refining Division, American Liberty Oil Co.; and N. H. Angell of Standard Oil Co. of California, completing the committee. The five vice-presidents elected with their respective divisional jurisdiction, were as follows: Division I: Atlantic-Gulf, Wallace D. Craig. Division II: Ohio-Great Lakes, D. N. Myers. Division III: Mid-West, L. W. Lee. Division IV: Southwest, Harold J. Buck. Division V: Pacific Coast, N. H. Angell. Bernard E. Gray was re-elected general manager-chief engineer, and Herbert Spencer, secretary of the institute. F. V. Widger, Witco Chemical Co., was re-elected treasurer and John N. Smith, Socony-Vacuum Oil Co., Inc., assistant treasurer. A. M. Maxwell, the newly elected President and Chairman of the Executive Committee, continues as a Vice President of the Standard Oil Co. (Ohio).

Transferred to Cincinnati Office

The Timken Roller Bearing Co., Canton, O., has announced the transfer of William E. Bryden, sales engineer, from the Chicago office to the Cincinnati office of the Timken Steel and Tube Division. He will be succeeded at Chicago by William T. Strickland, sales engineer.

Screen Co. Opens New Factory

C. Stuart Fielding, President of Screen Equipment Co., Inc., makers of Seco vibrating screens, has opened a new factory and general offices, at 1750 Walden Ave., Buffalo, N.Y. The factory has approximately 25,000 sq. ft. of floor space and will be devoted entirely to the manufacture of the Seco Line of vibrating screens.

Gar Wood Integrates Organization

W. H. Hammond

Gar Wood Industries, Inc., Wayne, Mich., has intergrated its organization to meet the continuing heavy demand for construction equipment. W. H. Hammond, vice president-sales has announced the appointment of E. B. Hill as general sales manager and R. F. Whitworth, general service manager and the creation of four domestic regional sales offices under Mr. Hill. Promoted to regional managers are Ross Miller, San Francisco (Western Region), A. C. Berg, Wayne, Michigan (Central Region), W. G. Barrett, Boston (Northeast Region) and H. C. Hatch, Washington, D. C. (Southeast Region). Concurrent with the establishment of regional offices, Gar Wood Industries, Inc., has consolidated its operations into three basic divisions. The Findlay Division, Findlay, O., will assume the manufacture and distribution of Gar Wood tractor equip-

an indispensable aid for 1948 construction problems

AMERICAN HIGHWAY PRACTICE

By CHARLES ILSLEY HEWES
Chief, Western Region
United States Public Roads Administration

Written in two volumes, *American Highway Practice* offers an up-to-date, thorough and detailed discussion of highway location, design and construction. Among the hundreds of points covered are: how to classify a highway as to future service, designing the cross section under varied conditions, how to apply bituminous material, costs of maintenance of the surface of penetration-macadam roads, etc. The results of important research and experimentation conducted during the past twenty-five years are also included. The volumes are fully illustrated with photographs, charts and line drawings.

"The book gives details of procedure yet is sufficiently general to give an overall picture. It is a book that will not only be used as a text book by engineers, but will also be utilized by the administrators. I think it is one of the best books of its type that I have seen on the subject."
—*Mr. Charles M. Upham, Engineer-Director, American Road Builder's Ass'n. Washington, D. C.*

1942	Vol. I	461 Pages	$5.00
	Vol. II	492 Pages	$6.00

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Please send me, for ten days' free examination, a copy of Hewes' AMERICAN HIGHWAY PRACTICE. If I desire to keep the books, I will remit price plus postage; otherwise I will return the books postpaid. ....
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2 TRUCKS IN 1 with the World's Only PICKUP DUMP

NATIONAL DUMP-O-MATIC

Saves 50%!
CUTS TIME AND LABOR IN HALF!

Slow, tiresome, back-breaking and hand pumping days are over! Here is the NEW Hydraulic, Cab-controlled Hoist for Pickup Trucks! Adaptable to practically all makes and models of ½, ¾ and 1 ton pickups. Easily operated by an Automatic Control Lever on the dash.

The Dump-O-Matic, adaptable to both USED and NEW pickup trucks, is available in a Conversion Unit (without body) and in a HOIST-and-BODY Unit. The National all-steel, all-welded Body comes in ½, ¾ and 1 ton sizes.

Write Dept. D-O-M for prices and full information.

ENGINEERED AND MANUFACTURED EXCLUSIVELY BY
NATIONAL TRUCK EQUIPMENT CO.
Waukesha • Wisconsin
TRANSPORTATION ENGINEERS

ment (scrapers, bulldozers, rippers) as well as Buckeye construction machinery (shovels, ditchers, finegraders, spreaders). The Wayne Division, Wayne, Mich., will continue to manufacture and distribute Gar Wood truck equipment (hoists, bodies, winches, cranes, tanks) and the St. Paul Division, Minneapolis, Minn., will manufacture and distribute St. Paul hoists, bodies and truck patrols. J. D. Towne has been appointed division manager and W. S. Blakeslee was promoted to sales manager of the Wayne Division. Promotions to district manager were also announced for H. N. Nelson, B. A. Cooper, E. R. Curry, W. D. Kerrick, R. J. Palmer, R. M. Steegman, D. C. Royce and W. R. Karll.

R. H. Hoy Retires

Randolph H. Hoy, for the past 19 years sales manager of the Pittsburgh territory of Universal Atlas Cement Co., subsidiary of U. S. Steel Corporation, has retired after 40 years of continuous service in the same territory with the cement company. He is succeeded by Fred L. Wagner, who has been assistant sales manager in the Pittsburgh territory for the past five months.

Van Dike Appointed Roebling Representative

L. H. Van Dike, Jr.

John A. Roebling's Sons Co., Trenton, N. J., manufacturers of wire rope and wire products, through E. C. Low, vice president in charge of sales, announces the appointment of L. H. Van Dike, Jr., as Detroit, Mich., representative, replacing the late Harry T. Hirbe, who died Nov. 24 in his 31st year. Van Dike, a former lieutenant in the USNR, is a graduate of Dartmouth College and the Tuck School of Business Administration. He has been associated with the company since 1946.

Marion Leases New Plant

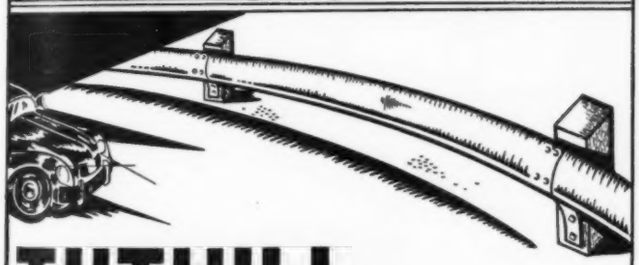
Marion Power Shovel Co., Marion, O., has leased the former Firestone rim plant in Cambridge, O., from The Community Industrial Association, an organization of Cambridge business men and firms. The contract carries the right to purchase outright at a later date. Construction work adapting the plant for Marion Power Shovel's use will begin soon. It is expected that manufacturing operations will start early in 1948.

Appointed Executive Vice President

R. S. Huxtable

Richard S. Huxtable has been appointed executive vice president and general manager of Fawick Airflex Co., Inc., Cleveland, O. Prior to his new appointment, he was assistant to George W. Codrington, vice president and general manager of the Cleveland Diesel Engine Division of General Motors Corporation. He became connected with the Cleveland Diesel Engine Division, then the Winton Engine Corporation, in March of 1934. He had been with that concern continuously since that date, holding a succession of important positions, including production supervisor, production superintendent and plant engineer.

IN THE SPOTLIGHT!



TUTHILL GUARD RAILS

for safe, sure service

Up-to-date highways need modern guard rail protection. Here's why it will pay you to install the TUTHILL Guard Rail:

SAVES LIVES. The springy, convex rail keeps cars from going off the road. At night, too, it shows up clearly under headlights, plainly marking the course of the road.

SAVES DOLLARS. The one-piece, weatherproof Tuthill Guard Rail is simplicity itself. Easy and quick to erect. Never can sag. Requires little or no maintenance.

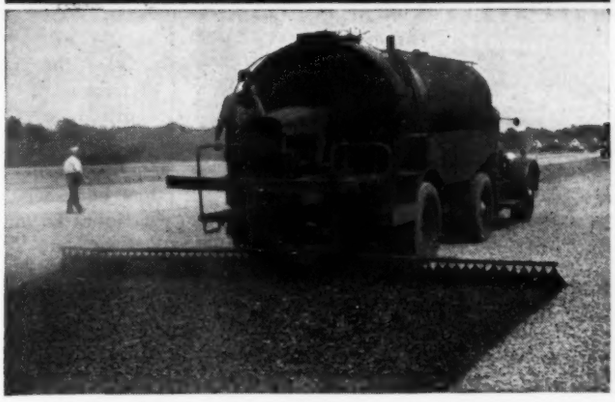
Be wise. Select the Tuthill Guard Rail for your highway installations.

TUTHILL SPRING CO.
761 W. POLK STREET, CHICAGO 7, ILLINOIS

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS



ACCURATE...DEPENDABLE...ECONOMICAL

On new road construction or making those much needed road repairs you can do the job faster, better and cheaper with an Etnyre "Black-Topper"... designed to save you time, labor and material. See your Etnyre dealer or write direct.

E. D. ETNYRE & CO., Oregon, Illinois

CONTRACTORS
RUBBER PRODUCTS
available from Stock
for immediate Delivery

CONVEYOR, ELEVATOR and
TRANSMISSION BELTING
all widths and plies
V-BELTS all sizes

HOSE
all sizes and types

AIR	DISCHARGE	STEAM
FUEL	COMPRESSOR	VACUUM
FIRE	PILE DRIVERS	SUCTION
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BOOTS, DREDGE SLEEVES,
PUMP DIAPHRAGMS, ETC.
. . . and everything rubber
for Industrial Requirements
Write for new catalog
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"Real Safety"
EMBURY
Luck-E-Lite
HIGHWAY TORCHES
Lowest Cost for Highest Dependability

Order through Your Jobber
EMBURY MFG. CO., WARSAW, N. Y.

New Mack Branch Manager

Harold J. Fikejs has been appointed manager of Mack Truck Co.'s Milwaukee direct factory brand. Mr. Fikejs, who at 31 is one of the youngest men in the company's history to hold a branch managership, has served Mack as truck salesman and district wholesale manager at the Des Moines Branch since he joined the company in 1946, following a 4-year tour of duty with the Army.

Haley Made District Manager

W. D. "Pete" Haley, assistant district manager since 1895, has been appointed district manager of the Pacific Northwest territory for the Lima Shovel and Crane Division, Lima-Hamilton Corporation, Lima, O. He joined the Lima-Hamilton organization when the Seattle branch office was opened in 1930, having charge of the office and repair parts service for the late Wm. C. Champion, who was district manager at that time.

Appointed Vice President-Export

W. C. Robertson

Walter C. Robertson has been appointed vice president-export for Gar Wood Industries, Inc., Wayne, Mich. He will handle all products of the three divisions of the company. Mr. Robertson has been with the company for 21 years, and for the past 11 years has been vice president in charge of national accounts. He has had his office in New York City, but in his new capacity his headquarters will be in the executive offices at Wayne. •

Eight New Davey Dealers

Appointment of eight new dealers and distributors is announced by Davey Compressor Co., Kent, O. New full line distributors of Davey portable and stationary compressors, lighting equipment and truck power take-offs are: National Equipment Co., 510-512 S. Clay St., Louisville, Ky.; M & F Equipment Co., Albuquerque, N. M.; C. H. Jones Equipment Co., 236 West South Temple St., Salt Lake City, Utah; J. W. Grass Equipment Co., 671 Ford Place, N. E., Atlanta, Ga. Named as industrial compressor dealers are Summit Hardware Co., 991 River St., Akron, O., and Portable Service Equipment Co., 3529-31 Front St., North Philadelphia, Pa. Warner & Derickson, Inc., 644 State St., Toledo, O., has been appointed as Davey dealer to handle Auto-Air (truck-mounted) compressors, Track-Air (tractor-mounted) units and Davey Heavy Duty Truck Power Take-offs. William S. Bolden Co., 814 Washington St., Charleston, W. Va., will sell and service Davey Air Chief portable and industrial compressors.

Scribner Heads Road Show Committee

Harvey A. Scribner, President of Russell T. Gray, Inc., Chicago industrial advertising agency, has been appointed chairman of the 1948 Road Show Promotion Committee by the American Road Builders' Association. The show will be held in Chicago on July 16-24, at Soldiers Field where road building and construction machinery manufacturers will exhibit equipment.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.
FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.
SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.
Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO.

Gets on the Job Fast . . . Cleans it up Fast

ANGLEDOZER

• Here's one of the handiest pieces of equipment you ever saw. It is a bulldozer *plus*. Besides the regular bulldozing position, it can be quickly and easily adjusted for six other angles. You always have exactly the right angle to do a particular job faster and better. And, Trojan's patented parallel lift mechanism always holds the blade steady—*no flopping around*.

Mount a Trojan Angledozer on your Industrial Wheels. Make them do double duty. Easy to mount . . . easy to operate . . . low in costs. Let your International dealer give you all the angles on the ANGLEDOZER, or write to Department RS-81.

CONTRACTORS MACHINERY CO., INC., BATAVIA, N.Y.

New Detroit Diesel Distributor

The Colorado Builders Supply Co., Equipment Division, Denver, Colo., and Scottsbluff, Neb., have been appointed industrial distributors for General Motors Series 71 Diesel engines. The territory covered by the new franchise takes in the entire state of Colorado with the exception of Moffat and Rio Blanco counties in addition to the Nebraska counties west of and including Sheridan, Garden and Deuel.

Sullivan Promoted by Universal Atlas

Joseph A. Sullivan, heretofore assistant publicity manager has been appointed manager, Advertising Bureau of Universal Atlas Cement Co., New York, N. Y. He succeeds Max A. Berns who died recently. Mr. Sullivan also was appointed director of public relations. Mr. Sullivan was assistant advertising manager of Columbia Phonograph Corporation, New York, from 1925 to 1927, leaving there to join the Biow Co., New York advertising agency, as copywriter. From 1929 to 1931, he was direct-mail advertising manager of Chicago Pneumatic Tool Co., New York, and from 1931 to 1935 was copy chief of Sweet's Catalogue Service Division of F. W. Dodge Corporation, New York. He returned to Chicago Pneumatic Tool Co. in 1935 as assistant advertising manager and was appointed advertising manager of that company in 1941. He joined Universal Atlas Cement Co. as assistant publicity manager in 1946.

Concrete

VIBRATORS and GRINDERS

Write for Circular on types, sizes and Prices

ELKHART White Mfg. Co. INDIANA

New Bearing Firm Organized

Organization of Dalc Bearings, Inc., to specialize in the engineered application and sale of anti-friction bearings, has been announced by Clayton A. Decker, president of the new firm. Offices have been opened at 1974 Broadway to distribute the anti-friction bearing products of several nationally known manufacturers. William B. Ashland will serve as vice president of the new firm, with Richard A. Laitinen named as secretary and treasurer.

New Richkraft Distributor

Pioneer Wholesale Supply Co., 830 S. 4th, West, Salt Lake City, Utah, has been named Richkraft distributor for the states of Utah, Southeast Idaho and Western Wyoming.

save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

JAHN TRAILERS ALL OVER the WORLD!

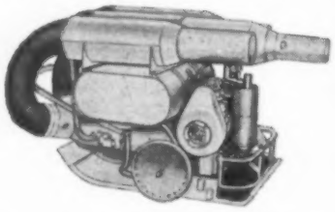
C. R. JAHN COMPANY

Dept. 1345—1106 W. 35th Street, Chicago 9, Illinois

Heavy duty trailers from 5 to 100 tons

CLEARING HOUSE

PORTABLE HEATER SALE IMMEDIATE DELIVERY



Stewart-Warner Portable Powerful 100,000 Btu Gasoline-Burning Heaters complete with Turbine Type Blower and 1½ HP. Air-Cooled Ball-Bearing Engine.

PORTABLE SELF-POWERED MANY PURPOSE HEATER

HEATING buildings, shops, sheds, warehouses, manholes, tunnels, buildings under construction, spot-heating, etc.

PREHEATING engines, tractors, trucks, equipment, etc.

THAWING frozen areas, machinery, pipe lines, tanks, etc.

DRYING plaster, paint, mortar, concrete, etc.

ORIGINAL COST $583.00

SALE PRICE $195.00

Complete with flexible ducts.

Send for literature.

BERNSTEIN BROTHERS
Since 1890

Dept. RS **PUEBLO, COLORADO**

CEDAR RAPIDS Asphalt Plant, 3,000# capacity, Model E boilers, Diesel operated. Practically new. Priced right.
BUCKEYE #12 Ditcher. Like new. $8,500.
GALLION Tandem Diesel 8-12 Roller, U-9 IH Diesel engine. Like new. Guaranteed. $3,500.00.
AUSTIN-WESTERN, Model ASU81B, Street Sweeper. Late model. Overhauled. Guaranteed. $1,775.00.
P. & H. # 100 ⅝ cu. yd. Combination Shovel-Crane. Overhauled. $4,250.00.
NORTHWEST #4 ser. #3589 Dragline, 45 ft. boom, 1¼ cu. yd. bucket. Overhauled. $5,850.00.
BROOKS Load Lugger CH-200 mounted on practically new International KS-5 truck. $1,700.00.
DEMPSTERS LF-200, late model, including buckets. $600.00.
LIPPMANN 24"x36" RB. latest model Jaw Crusher. New. Weight 32,000 lb.—Rent apply purchase price. Original cost $11,000.00—Our price $8,000.00.
If you need shovel attachments, booms, fair leads, send us inquiry. Have over thirty our yard.
Also Potable Compressors, Crushing Outfits.
MURPHY Diesel ME-6, 150 H.P. Power Unit. Like new. $3,000.00. Other smaller Diesel units.

Wenzel Machinery Rental & Sales Co.
2136 Jefferson St. Kansas City, Mo.

20—NORTHWEST SHOVELS, Model 25, with Trench-Hoe, Dipper and Crane attachments, Caterpillar D-4600 Diesel Engines, practically new.

For Sale or For Rent

KEN ROYCE INC.
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FOR SALE

ASPHALT EQUIPMENT:

Cedar Rapids Hot or Cold Mix Asphalt Plant, 3,000# Capacity, Model E Diesel Operated, Dust Collector, 4 Storage Tanks with Heating Coils 35,000 capacity, 125 horse Boiler complete with all pumps and piping.
Barber Greene Finishing Machine, Hydraulic Control.
1—1,000 gal. Etnyre Distributor, late model, mounted on Diamond "T" Truck.
1—650 gal. Etnyre Distributor mounted on Diamond "T" Truck.
Gallon 5-8 ton Tandem Roller, late model.
10-ton Kelly Tandem Roller, converted.
3½-ton Austin Pup 3-wheel Roller.
Ferguson Patch Roller, late model.
9-Wheel Wobble Wheel Roller.
White Tractor and 3,000 gal. Trailer with Coils.
5 Relay Tanks, 800 to 1,000 gal. capacity.
Grace Mechanical Broom Trailer, axle driven.
Chevrolet Flat Bed Truck, 1937 model.
Ford Flat Bed Truck, 1937 model.
20-ton Truck Scales.
Cleaning Machine.

CONCRETE PAVING EQUIPMENT:

27 E. Koehring Paver
4000' 90x8 Road Forms.
800' Lip Curb Forms.
2 Lakewood Finishing Machines 10'x20'.
2 Sub Graders, 10' and 20'.
4 Cement Carts.
1 Cement Scale.
1—50-ton Blaw-Knox Bin and Weighing Batchers.
All equipment located in or near Kansas City, Missouri—excellent condition.

Bowen Construction Co.
1914 Highland Avenue
Kansas City, Missouri
Phone: Victor 4251

FOR SALE

2 only—32 x 27 HAMMERMILLS.

1 only—40 x 36 HAMMERMILLS.

New units of sturdy quality, standard make, immediate delivery. Prices on application.

1 only—10 x 20 R. B. JAW CRUSHER.

1 only 10 x 40 R. B. JAW CRUSHER.

Above are new. Immediate delivery, at exceptionally low prices. Several more available two weeks delivery—prices on application.

1 only — 18" x 20' long. Portable all-steel FLIGHT CONVEYOR—mounted on steel wheels. Price, without power (f.o.b. Mpls.) $500. All subject to prior sale.

Write Box 114 Roads & Streets, 22 West Maple St., Chicago 10, Ill.

FOR SALE

6—Ford Euclids Bottom Dump.
8—10 C.Y. Capacity, Excellent Condition.

Price $30,000.00

Augustine Contractors Co.
Clearfield & Melvale St. Phila. 34, Pa.
Telephone RE-9-1286

HOSE SALE

Brand New 4-Inch

SUCTION HOSE

USES: Portable Pipe Lines; Handling Water, Liquids, etc.; Sewer & Trench Work; Manholes; Suction or Discharge on Pumps; Mines; General Heavy Duty suction work, etc.

DESCRIPTION: New Heavy-Duty 4-inch inside diameter steel-reinforced Suction (or Discharge) Hose complete with male and female fittings. Abrasion-resistant rubber; heavy steel wire reinforcing; plies of heavy fabric. All in 10-ft. lengths complete with fittings. Smooth bore. Couplings are built-in, full-flow, with fixed lug nuts on one end and hend lug swivel nuts on other end; recessed to hold washer in place when hose is disconnected; Eliminates necessity of using wrench.

SALE PRICE is less than ONE-FOURTH the regular NEW PRICE

PRICE per 10-ft. length complete with male and female fittings, brand new. $12.00

BERNSTEIN BROTHERS
SINCE 1890

Pueblo, Colorado **Phone 8404**

FOR SALE

New 840 Barber Green Asphalt Plant with Pugmill, Hopper, Feeder, 350 Gallon Kettle, Dust Collector, Dryer, and all accessories.

Immediate delivery—Bargain price.

WATKINS-ALDRIDGE EQUIPMENT CO.
Jackson, Mississippi

FOR SALE

1 Ford-Ferguson Tractor, Ser. 9N1658, 8x32 tires, in excellent rebuilt condition. Equipped with Detroit Rotary sweeper on front, Mod. NL5002. Has electric starter and lights. Clean painted, looks good, ready now. Price, subject prior disposition, acceptance, and payment here, with sweeper $1,425.00
Tractor alone 1,150.00

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Just a Whisper From Stribling Bros.
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EXECUTIVE SALES ENGINEER

With mechanical engineering background in the petroleum, road building and highway machinery and equipment industries. Have broad knowledge of sales methods and have worked with top management as saleman, sales manager and sales promotion director. Available now. Resume and references supplied on request.

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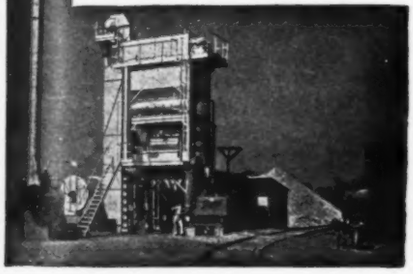
ARIENS
FOR SECONDARY ROAD CONSTRUCTION
AGGMIXER

Here's equipment designed especially for mixed-in-place construction — to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate . . . adjustable to any tractor . . . made 4 standard sizes, 4', 5', 6' and 7'. Write for details.
The swirling, shopping action of these tines does a thorough job of mixing, wet or dry.
ARIENS COMPANY
BRILLION, WIS

RELIANCE
CRUSHING, SCREENING and WASHING UNITS
● Up to 2000 Tons a Day ●
Crushers, Elevators, Sweepers, Screens, Wash Boxes
Bins, Pulverizers, Feeders, Spreaders, Kettles, Conveyors
Drag-Lines, "GAYCO" Centrifugal Air Separators
UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.
Canadian Representatives: F. H. Hopkins & Co., Ltd. 140 Canada Cement Co., Montreal, Que., Can.

PORTABLE ASPHALT PLANTS
High Production—Low Cost

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NORRISTOWN, PENNA.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS
ARE MADE in a complete line of sizes to fit all standard compressed air hammers.
Send for NEW Vulcan illustrated CATALOG today.
VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY
VULCAN TOOL MFG. CO.
QUINCY, MASS.

Made General Sales Manager

R. J. Nymberg

R. J. (Ray) Nymberg of Detroit, Mich., has been appointed general sales manager of Hercules Steel Products Corporation, Galion, O. He will have charge of sales and advertising of Hercules automotive products and will be assisted by an enlarged staff of sales engineers and district representatives. Mr. Nymberg has previously been associated with Gar Wood Industries, Inc., Wayne, Mich., having served as body engineer from 1921 to 1932, sales engineer and assistant sales manager from 1932 to 1945, sales manager of the hoist and body division from 1945 to April, 1947, and since that date has served as sales manager of the truck equipment division.

Appointed Parts and Service Manager

H. A. Pratt has been appointed parts and service manager of Davey Compressor Co., Kent, O. A veteran of over 20 years of company service, Mr. Pratt was formerly superintendent of the Kent, O., plant.

Distributors for Drott

The twin-controlled tilting bulldozers, Bullangle-dozers, Bullclam shovels and Hi-Lift loaders of the Drott Manufacturing Corp., Milwaukee, Wis., are now sold and serviced by Oliver Cletrac dealers throughout the country.

Changes in Levee Specifications

The following is a brief summary of the changes to be made in specifications in the Memphis, Vicksburg and New Orleans Districts:

Paragraph 7.—**Payments and Acceptance**—Recent specifications provided that—"Except as otherwise provided herein . . . only 75% of the estimate will be allowed in the case of fill not completed to gross grade and cross section, and dressed and sodded . . ." This provision will be eliminated and will revert to the established 90% payments.

Paragraph 14. — **Accommodations for Government Employees.**—In recognition of the rising cost of living, contractors henceforth will be paid at the rate of $1.00 per night for each Government employee lodged, and 75 ct. per meal for each Government employee subsisted. The scale heretofore has been 50 ct. per night and 30 ct. per meal.

Paragraph 18.—**Preparation of Foundation.**—The contracting officer will resume payment for filling stump holes.

Paragraph 34G.—**Dressing and Sodding.** — The final sentence — "The method of sodding shall be as authorized by the contracting officer" will be eliminated.

Paragraph 35.—**Plant.**—No change in wording will be made, but contracting officers will be instructed to be more lenient in permitting contractors to remove equipment no longer needed.

Booklet on Money Making at Airports

Valuable suggestions to owners of airports are contained in a new study, "Non-Aviation Revenue Producing Functions for Airports," released by the Civil Aeronautics Administration.

Prepared by the Office of Airports of the CAA, the publication is not a comprehensive study of the subject but, rather, is designed to act as a guide to airport owners in supplementing revenue obtained strictly from aviation sources.

Copies of the booklet may be obtained without charge from the CAA Office of Aviation Information, Washington 25, D. C.

●

High British taxes on cars—Taxes on automobiles selling for more than $4,000 have been increased to 67% by England in order to discourage manufacture of luxury cars. The cheapest Rolls-Royce, as a result, sells for $23,000.

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS — any make
We will buy or trade in old Transits Levels, Alidades, etc. Send instruments for valuation.
Write for new Catalogue RS-21, of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.
WARREN-KNIGHT CO.
Mfgrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.

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Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

Check below advertisements on which you wish information on products featured:

*Adams Mfg. Co., J. D. 56
*Allis-Chalmers, Tractor Division 14-15
American Cable Division ..... Third Cover
*Ariens Co. 131
*Austin-Western Co. 40-41

*Barber-Greene Co. 13
*Bethlehem Steel Co. 1
Blackhawk Mfg. Co. 65
*Blaw-Knox Co. 11
Bucyrus-Erie Co. 47

Carlyle Rubber Co. 128
Caterpillar Tractor Co. 9
*Cleaver-Brooks Co. 20
Colorado Fuel & Iron Co. 35-36
*Contractors Machinery Co. 129
Cunningham Son & Co., John 46

Detroit Diesel Eng. Div. 27
Dow Chemical Co. 8

Eaton Mfg. Co. (Axle Div.) 33
*Electric Tamper & Equip. Co. 119
*Embury Mfg. Co. 128
*Erie Steel Construction Co. 51
Euclid Road Machinery Corp. 4

*Flintkote Co. 17
Ford Motor Truck 32-61
*Foote Co. 39

*Galion Iron Works & Mfg. Co., The 37
Gemmer Mfg. Co. 12
Gillette Pub. Co. 24-26-34-42-50
*Grace Mfg. Co., W. E. 46

*Hanson Clutch & Machinery Co. 123
Hazard Wire Rope Division ..... Third Cover
*Heltzel Steel Form & Iron Co. 96
Hetherington & Berner, Inc. 122
Highway Equipment Co., Inc. 121
Homelite Corp. 31
Hose Accessories Co. 125
Huber Mfg. Co., The 69

*International Harvester Co. 44-45
*Iowa Mfg. Co. 73

Jackson Vibrators, Inc. 119
*Jaeger Mach. Co., Inc. 21
*Jahn Co., C. R. 129
Johnson Co., The, C. S. 48-49

Koehring Co. 48-49
Kwik-Mix Co. 48-49

*La Crosse Trailer & Equipment Co. 46
*Le Roi Co. 23
Leschen & Sons Rope Co., A. 77
Le Tourneau, Inc., R. G. 6-7
*Littleford Bros. 30
Little Giant Products, Inc. 118

McCarter Iron Works, Inc. 131
Mack Trucks, Inc. 97
*Minneapolis-Moline Power Impl. Co. 30

Nat'l Truck Equip. Co. 126
Northwest Engr. Co. 5

*Osgood Co. 43
Ottawa Steel Products, Inc. 81
*Owen Bucket Co., The 46

Parsons Co., The 48-49
Penna. Refining Co. 126
Perfection Steel Body Co. 28
Quick-Way Truck Shovel Co. 85

Rehberger & Son, Arthur 93
Rogers Brothers Corporation 124

Sauerman Bros., Inc. 124
Schield Bantam Co. 92
Schramm, Inc. ..... Inside Front Cover
Shunk Mfg. Co. 128
Standard Oil, Calif. 100
Standard Oil, Ind. 22
*Texas Co., The ..... 52 Back Cover
Thew Shovel Co., The 3
*Timken Roller Bearing Co. ..... Front Cover
Trackson Co. 25
*Tuthill Spring Co. 126

Unit Crane & Shovel Corp. 19
United States Steel 18
Universal Atlas Cement Co. 18
*Universal Engineering Corp. 89
Universal Road Machinery Co. 131
Upson-Walton Co., The 16

Vulcan Tool Mfg. Co. 131

*Walter Motor Truck Co. 10
Warren-Knight Co. 131
*Wellman Engineering Co., The 28
*White Mfg. Co. 129
Wiley & Sons Co., John 126
Winter-Weiss Co. 120
*Worthington Pump & Mchy. 29

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Check other products below on which you wish us to obtain information for you:

AGGREGATE:
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- ☐ Conveyors
- ☐ Crushers
- ☐ Portable Plants
- ☐ Screens

BITUMINOUS:
- ☐ Batchers
- ☐ Finishers
- ☐ Distributors
- ☐ Dryers
- ☐ Heaters
- ☐ Plants (central)
- ☐ Plants (travel)

CONCRETE:
- ☐ Batchers
- ☐ Buggies and Carts
- ☐ Finishers
- ☐ Joints, Expansion and Contraction
- ☐ Reinforcement Accessories
- ☐ Metal Road Accessories
- ☐ Mixers (under 1 yd.)
- ☐ Mixers (1 yd. up)
- ☐ Pavers
- ☐ Reinfor-ing Steel
- ☐ Road Forms (1000' set)
- ☐ Tower
- ☐ Truck Mixers

CRANES:
- ☐ Crawler Mounted
- ☐ Truck Mounted
- ☐ Piledrivers

GRADERS:
- ☐ Blade, self propelled
- ☐ Blade, pull type
- ☐ Blade, under truck
- ☐ Elevating

LOADERS & TRENCHERS:
- ☐ Front-end loader (tractor mounted)
- ☐ Loader, bucket type and belt type
- ☐ Trencher or Ditcher

HAULING EQUIPMENT:
- ☐ Dump Trucks, self-powered
- ☐ Dump Wagons, tractor drawn
- ☐ Flatbed Trailers
- ☐ Other Trucks

PUMPS:
- ☐ Centrifugal
- ☐ Concrete
- ☐ Diaphragm
- ☐ Mud Jacking
- ☐ Piston
- ☐ Wellpoint

POWER UNIT: (Independent)
- ☐ Gasoline
- ☐ Diesel
- ☐ Electric

ROLLERS:
- ☐ Power (Smooth)
- ☐ Pneumatic Tire
- ☐ Sheepsfoot

TRACTORS:
- ☐ Crawler
- ☐ Rubber-Tired

TRACTOR EQUIPMENT:
- ☐ Dozers
- ☐ Power Control Units
- ☐ Rippers
- ☐ Scrapers, tractor drawn
- ☐ Scrapers, self-powered

BUCKETS:
- ☐ Clamshell
- ☐ Concrete
- ☐ Dragline
- ☐ Orange Peel

SHOVELS & DRAGLINES:
- ☐ Crawler (under 1 yd.)
- ☐ Crawler (1 yd. up)
- ☐ Truck Mounted

ROCK DRILLS & AIR TOOLS:
- ☐ Air Compressors
- ☐ Backfill Tampers
- ☐ Clay Diggers
- ☐ Concrete Vibrators
- ☐ Drills, cabel tool
- ☐ Drills, tripod and wagon
- ☐ Drills, rock, hand-held
- ☐ Paint Sprayers
- ☐ Paving Breakers
- ☐ Riveters and Chippers

MISCELLANEOUS:
- ☐ Buildings, portable
- ☐ Earth Drills, power
- ☐ Light Plants
- ☐ Lubrication, Service Truck
- ☐ Mowers, Highway
- ☐ Power Saws
- ☐ Soil Stabilizing Equipment
- ☐ Snowplows, rotary
- ☐ Snowplows, v or wing
- ☐ Spreaders, sand or cinders
- ☐ Street Flushers
- ☐ Street Sweepers
- ☐ Welders
- ☐ Cutting Torches
- ☐ Hydraulic Jacks
- ☐ Hydraulic Control Equipment
- ☐ Hand Tools
- ☐ Hoists, derrick type

Be sure to fill in name and address below:

Your Name ..... Title or profession .....

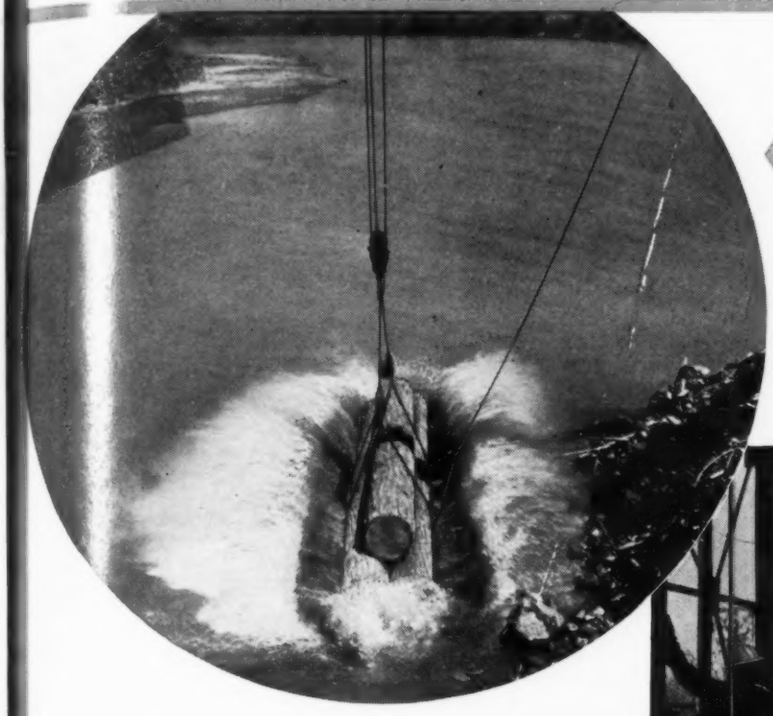
Name of your company or governmental department .....

Type of work for which equipment will be used .....

Street Address .....

City ..... State ..... County .....

Improving Production with LAY-SET PREFORMED



Dropping logs into the river with a swing boom unloader. When logs hit water an automatic trip on the hooks frees the mainline straps. Buoyancy of logs in water slacks the mainline, and weight jerks hooks free from strap loops. With a load of 5,000 board feet (40,000 pounds), that's a lot of lifting, jerking and quick-slackening for the wire rope—but Hazard LAY-SET Preformed takes it in stride.

In oil drilling—Improved production with LAY-SET Preformed wire rope is quickly evident in the oil fields. Because LAY-SET is a "relaxed" wire rope, it takes bending stresses, whipping and straining—with ease. The result is fast, uninterrupted production—more barrels of oil per day.

Short wall cutting machine at work in a coal mine. Here, where wire rope failures would seriously affect production, operators depend upon LAY-SET Preformed wire rope. Its longer life means steadier, more profitable production.

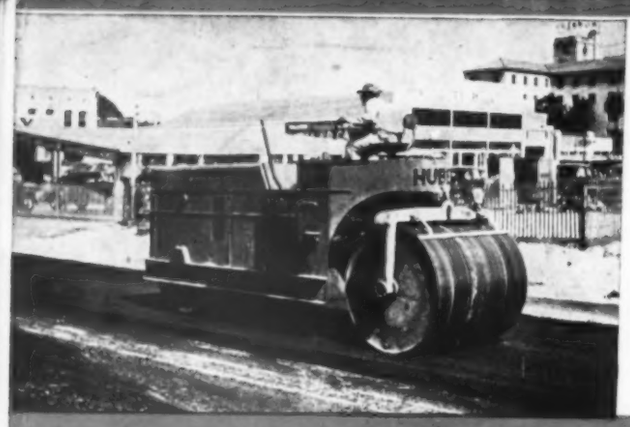
***LAY-SET** Preformed wire rope will improve production on your lifting and pulling jobs too. Be sure to specify* LAY-SET Preformed *the next time you need wire rope.*

ACCO *In Business for Your Safety*

TRADE MARK

HAZARD WIRE ROPE
A DIVISION OF AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.



Corpus Christi pave

with resilient, heavy-duty Texaco Asphalt constructio

Approximately 35 miles of new paving has been laid on streets of Corpus Christi, Texas, the past two years. Hot plant-mixed asphalt construction was used exclusively by the city in carrying out this outstanding paving program.

For the most part, Corpus Christi's plans called for resurfacing old, worn streets with a new, easy-riding asphalt wearing surface. Some thoroughfares, however, required a base as well as a surface. Plant-mixed asphalt construction was specified for both base and surface on such streets, providing a six-inch thickness of durable, shock-absorbing asphalt pavement.

A Texaco Asphalt product of 85-100 penetration wa employed by Brown & Root, Inc., of Houston, an J. M. Dillinger, Inc., of Corpus Christi, the contractor who shared this important municipal paving project Refined from carefully selected crudes for more tha 40 years Texaco Asphaltic products have won the con fidence of road builders throughout the United State and abroad.

If you have a street, highway or airport paving problem, why not discuss it with a Texaco representative who is an asphalt specialist? You will find his experience helpful. Write to our nearest office.

Thirty blocks of wide, busy Leopard Street in Corpus Christi were resurfaced with plant-mixed Texaco Asphalt paving.

Both the foundation and surfa of this Lipan Street pavement a of Texaco Asphalt construction.

Corpus Christi used 6½ inches Texaco Asphalt construction this 5-year-old North Brownl Boulevard pavement.

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd Street, New York City 17
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TEXACO
REG. T. M.

TEXACO ASPHAL